



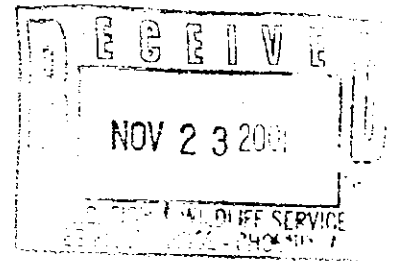
United States Department of the Interior

FISH AND WILDLIFE SERVICE

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NOV 16 2001



Consultation No. 2-21-94-F-192R1

Memorandum

To: Field Manager, Phoenix Field Office, Bureau of Land Management

From: Regional Director, Region 2

Subject: Remanded Biological Opinion for Five Livestock Grazing Allotments in the Vicinity of Ajo, Arizona

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of ongoing grazing on five Bureau of Land Management (BLM) allotments in the vicinity of Ajo, located in Maricopa and Pima counties, Arizona, and the effect on the Sonoran pronghorn (*Antilocapra americana sonoriensis*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA).

In response to *Defenders of Wildlife, et. al., v. Bruce Babbitt, et. al.* (Civil Action No. 99-927 [ESH]), Judge Ellen Huvelle of the United States District Court (Court) for the District of Columbia issued a Memorandum Opinion and Order on February 12, 2001. The Court found that the Service failed to address the impact of various Federal actions on the Sonoran pronghorn when added to the environmental baseline and failed to include in the environmental baseline the impacts of all Federal activities in the area that may affect, directly or indirectly, the pronghorn.

The Court provided the Service 120 days to produce, in consultation with the defendants, revisions of the following biological opinions: Air Force (USAF) (August 1997), Army National Guard (ARNG) (September 1997), BLM (December 1997), Marine Corps (April 1996), and National Park Service (NPS) (June 1997). The Court ordered that the Service, in consultation with the Federal agencies whose biological opinions have been remanded, must reconsider those portions of the opinions that have been found to be contrary to the dictates of the ESA. This includes the scope of the action area, analysis of the environmental baseline, and analysis of the effects of incidental take in context with a revised environmental baseline. On April 12, 2001, the Court granted the Service an extension until November 16, 2001, to complete this task.

The BLM and the Service consulted informally on effects of livestock grazing in the five allotments on the lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*) and the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*). The Court did not remand the consultation regarding these species, thus they will not be addressed further herein.

This biological opinion is based on information provided during the previous consultation on this action, updated information on the proposed action provided by your agency, new information on the status of the pronghorn, telephone conversations, and other sources of information as detailed in the consultation history. A complete administrative record of this consultation is on file in the Phoenix, Arizona, Ecological Services Field Office (ESO).

CONSULTATION HISTORY

The December 3, 1997, biological opinion on this action provides a history of the consultation from January 31, 1994, through the issuance of the biological opinion. The biological opinion concluded that proposed livestock grazing activities on the five allotments was not likely to jeopardize the continued existence of the pronghorn. The opinion also included our concurrences with the BLM's determinations that the action may affect, but was not likely to adversely affect, the lesser long-nosed bat and cactus ferruginous pygmy-owl.

In a memorandum dated June 16, 1998, BLM requested clarification from the Service regarding the terms and conditions of two biological opinions: (1) the five grazing allotments opinion (December 3, 1997, consultation number 2-21-94-F-192) and (2) the Lower Gila South Resource Management Plan and Amendment (March 27, 1998, consultation number 2-21-85-F-069). The 1998 biological opinion included a term and condition that required all fences to be made passable for pronghorn within one year of the date of the opinion. The 1997 biological opinion did not have this term and condition. The BLM's project description for the five allotments stated that all fences being replaced or repaired would be made passable by having a bottom strand of smooth wire, 16 inches above ground level. BLM requested to proceed under the terms and conditions of the 1997 biological opinion and that the Service amend the 1998 opinion to reflect the change. In summer 2000, BLM modified the fences in the Ajo allotments to make them passable for pronghorns.

In a memorandum dated April 13, 2000, BLM submitted their 1998-1999 report regarding vegetation monitoring results and implementation of the terms and conditions per the terms and condition of the December 3, 1997, opinion. In a memorandum dated November 28, 2000, BLM submitted their 2000 report regarding vegetation monitoring results and implementation of the terms and conditions. On December 11, 2000, BLM provided a map via facsimile showing the fencelines within the Cameron, Why, and Coyote Flat allotments that had been modified to be passable by pronghorn.

As discussed in the introduction to this opinion, Civil Action No. 99-927 [ESH], *Defenders of Wildlife, et al. v. Bruce Babbitt, et al.* precipitated this biological opinion and four others. In a

February 12, 2001, order, Judge Ellen Huvelle ruled (in part): "...that the Fish and Wildlife Service has acted in a manner that is arbitrary and capricious and contrary to law by issuing biological opinions that fail to address the impact of each defendant's activities on the pronghorn when added to the environmental baseline, 50 C.F.R. §§ 402.02, 402.12(g), and fail to include in the environmental baseline the impacts of all Federal activities in the area in which defendants are proposing or engaging in action that may affect, directly or indirectly, the pronghorn, 50 C.F.R. §402.02." And the court "further ordered that this matter is remanded to Fish and Wildlife Service, which has 120 days from the date of the Order to reconsider, in consultation with defendants, those portions of the Biological Opinions that have been found to be contrary to the dictates of the Endangered Species Act."

The Judge's order also required preparation of supplemental Environmental Impact Statements (EIS) for the Marine Corps Air Station-Yuma's (MCAS-Yuma) Yuma Training Range Complex (YTRC) and Organ Pipe Cactus National Monument's (NM) General Management Plan, and, in regard to the Sonoran pronghorn recovery plan, required the Service to develop objective, measurable recovery criteria and schedules for implementing recovery actions. A draft supplemental EIS for the YTRC was produced in June 2001. This document clarified those actions that may affect Sonoran pronghorn and described how those effects would manifest.

On July 19, 2001, the Service met with the BLM's Phoenix District Office to discuss the biological opinion and conservation measures that could be incorporated into the proposed action to minimize or eliminate these effects. On July 25, 2001, the BLM and Service met to discuss further the effects of the action and possible measures to avoid and minimize the effects that the Service recommended during the July 19, 2001, meeting. As a supplement to the information in the 1995 environmental assessment (EA), BLM provided a table showing the grazing use on the four allotments in the vicinity of Ajo from 1992 through 2001. On July 27, 2001, the Service requested, via e-mail, additional information (e.g., grazing use on the Sentinel Allotment), clarifications of discrepancies between the 1992-2001 table of actual use and the 1995 EA, and a map showing the locations of study plots/transects within the allotments, Cabeza Prieta National Wildlife Refuge (NWR), and Organ Pipe Cactus NM. On July 31, 2001, BLM responded to the Service's information request via e-mail. The map of study plots was delivered to the Service on August 3, 2001.

On August 1, 2001, the Service received an e-mail from BLM that listed those measures that they could implement as part of the proposed action. On August 2, 2001, the Service met with BLM and other agencies involved in management of the Barry M. Goldwater Range (BMGR) and the pronghorn at a meeting of the Barry M. Goldwater Executive Council (BEC). We met to discuss the remanded biological opinions and the possible measures to avoid or minimize adverse effects of proposed actions. On October 11, 2001, the BLM sent the Service a memorandum modifying the project description to limit the life of the project to November 1, 2002. A draft of the biological opinion was provided to BLM for their review on October 23, 2001. BLM provided their comments on the draft opinion to the Service in a memorandum dated November 7, 2001.

BIOLOGICAL OPINION

I. DESCRIPTION OF PROPOSED ACTION

Proposed Action

The Federal action is the issuance of a 10-year grazing permit on five allotments, totaling 213,616 acres (ac), within the management authority of the BLM's Phoenix Field Office in Maricopa and Pima counties. On or about January 15, 2002, BLM proposes to finalize their Rangeland Health Allotment Evaluations conducted this year and reinitiate consultation regarding continued grazing of the five allotments. Implementation of the revised project description (including any requirements of the reinitiated biological opinion) is expected to occur by November 1, 2002. The life of the project that is currently being analyzed in this biological opinion will expire as of November 1, 2002. The five allotments consist of the Cameron Allotment (67,234 ac), Childs Allotment (102,480 ac), Coyote Flat Allotment (11,520 ac), Why Allotment (10,506 ac), and Sentinel Allotment (21,876 ac) (Figure 1).

The Sentinel Allotment is south of Interstate 8 and is separated from the other four allotments by the BMGR, which forms the southern boundary of the allotment. The other four allotments form a block of land that surrounds the towns of Ajo and Why, Arizona. This block of allotments (Ajo allotments) has its northern boundary and the northern portion of its western boundary with the BMGR, the majority of the western boundary with Cabeza Prieta NWR, the southern boundary with Organ Pipe Cactus NM, and the eastern boundary with the Tohono O'odham Nation. State Route 85 (SR 85) bisects the Childs, Cameron, and Coyote Flat allotments and a small portion of the Why allotment.

The five allotments are classified as perennial/ephemeral, meaning they have a base allocation of animal unit months (AUM) (the amount of forage required to feed a cow with a calf for one month) for year-long operation. Perennial/ephemeral allotments are generally cow-calf operations which may also graze steers during years of favorable ephemeral forage growth. The permitted number of AUMs is based on historic use and mutual agreement with the permittee. Permitted AUMs for the Ajo allotments were set in 1973 and for the Sentinel Allotment in 1981 as follows:

- Cameron = 2526 AUMs (210.5 head, 2.00 head per section)
- Childs = 3802 AUMs (316.8 head, 2.00 head per section)
- Coyote Flat = 456 AUMs (38 head, 2.20 head per section)
- Why = 452 AUMs (37.7 head, 2.40 head per section)
- Sentinel = 360 AUMs (30 head, 0.94 head per section)

The ephemeral part of the grazing classification recognized that the allotments have the potential to provide significant forage during wet years in the form of annual vegetation, thereby giving the permittee the option to request livestock use of the seasonally abundant annual production.

Additional livestock grazing is authorized for ephemeral use under a supplemental grazing license when sufficient forage is present and such use does not conflict with other resources or damage the perennial vegetation base. There are no set AUMs for ephemeral use. Ephemeral permits are considered upon request and dealt with separately from the perennial permit. The ephemeral stocking rate is based on the amount of annual vegetation present at the time of the request.

According to the guidelines for permitting ephemeral grazing, the following criteria have to be met:

1. Presence of ephemeral vegetation in draws, washes, and under shrubs.
2. Sufficient surface and subsurface soil moisture for continued plant growth exists.
3. Ephemeral forage has grown to useable levels by the time grazing begins.
4. Enough serviceable waters exist to provide good grazing distribution on the allotment for the number of livestock to be authorized.
5. All range improvements and livestock facilities needed for proper administration of authorized grazing use are properly maintained.
6. The level of grazing use allows for sufficient annual vegetation to remain on site to satisfy other resource concerns (i.e., watershed, wildlife, wild horses and burros).

If there are known resource conflicts with livestock grazing (such as habitat for special status species) ephemeral authorizations will be limited to a maximum of 30 days per authorization (see Appendix 4 of the biological evaluation for more details).

The Cameron, Childs, and Sentinel allotments are considered "maintain" allotments (allotments less intensively managed due to their low resource potential, lack of conflicts, or other considerations). The Coyote Flat and Why allotments are "custodial" allotments (allotments for which only limited management occurs). Monitoring transects for Sentinel, Coyote Flat, and Why allotments were established in 1998. The Cameron Allotment permittee has not grazed the full number of permitted AUMs for a sustained period of time. According to BLM, monitoring data do not show overutilization of the vegetation on the allotment, as well as no discernable loss in vegetative cover, since the establishment of three monitoring transects in 1989. Beginning in 1998, BLM began reading the utilization transects for Cameron annually. BLM estimates that, if allotments were stocked at permitted levels, utilization rates could approach 40 percent.

In the summer of 1997, 10-year permits were issued for these five allotments pursuant to 43 CFR 4130.2(d). At the start of each grazing season, the permittees determine how much of their permitted amount of AUMs to use. Because the amount may vary on a yearly basis and is due to a number of factors, it is difficult to predict future livestock use on the allotments. Regardless of past use, the operator may use a portion or all of his permitted amount of AUMs every year and, in addition, may activate ephemeral use in years in which conditions permit the emergence of abundant annual forage. Table 1 shows the amounts of AUMs from 1970 to 2001 for each of the

allotments. These allotments have no formal grazing systems in place and the BLM does not anticipate preparing allotment management plans for them.

According to BLM, livestock use within the five allotments has been relatively low for the past ten years. The effects of stocking the allotments at any level has not been analyzed. In southern Arizona, livestock forage use during the late winter/early spring period is typically on annual forage. Depending upon climatic conditions, May-June use is mainly on perennial forage (trees, shrubs, grasses, and forbs) supplemented by annuals. Dry annuals are used in all seasons, as available. Late summer forage use is derived primarily from the foliage and beans of trees and shrubs, such as palo verde (*Parkinsonia* spp.), catclaw acacia (*Acacia greggii*), and mesquite (*Prosopis velutina* and *P. glandulosa*).

On the Cameron Allotment, the permittee has proposed to redevelop an existing, non-functioning range improvement to supplement a seasonal earthen tank. The redeveloped water, referred to as "New Well," is proposed to consist of a submersible pump, a 10,000-gallon storage tank, approximately three miles of plastic PVC pipe, and a water trough. Water will be pumped to the storage tank at the well site. The PVC pipe will connect the storage tank to a water trough several miles away. The pipeline will be installed adjacent to an existing road in order to decrease surface disturbance. This part of the project is intended to replace or supplement the earthen reservoir referred to as "Bob's Tank." This range improvement was proposed in the project description in the 1997 biological opinion. To date, the permittee has not initiated this redevelopment (G. Dahlem, BLM, pers. comm. 2001).

Maintenance of existing improvements consists of replacing or repairing pipelines, pumps, storage tanks, fencelines, refurbishing or redrilling wells, and excavating silted-in tanks. Fencelines, pipelines, and above-ground storage tanks will be inspected annually and repaired and replaced as necessary. Maintenance of pumps will occur approximately every two years and will range from servicing motors to redrilling new wells. Dirt tanks will be excavated approximately every 10 years with heavy equipment.

Proposed Conservation Measures

The following measures have been or will be implemented as part of the proposed action to minimize adverse affects to the pronghorn:

1. Between June and August of 2000, 18 miles of fencing between the Cameron, Why, and Coyote Flat allotments were modified by replacing the bottom strand of barbed wire with a strand of smooth wire, 18 inches above ground level; the removed wire was properly disposed of (M. Taylor, BLM, *in litt.* 2000).
2. BLM will initiate a campsite and route designation as part of the Land Use Plan amendment process with the purpose of limiting vehicle access to designated, signed routes only, and to reduce route densities in sensitive areas. This process is scheduled to

begin in fiscal year 2002 and be completed within three years (by the end of fiscal year 2004).

3. BLM will continue to strictly enforce the 14-day camping limit.
4. BLM will continue to contribute to the multi-agency funding of the on-going monitoring efforts.
5. BLM will contribute to implementation of the 51 priority recovery projects identified by the Sonoran pronghorn recovery team (Appendix 1).

II. STATUS OF THE SPECIES

A. Description and Legal Status

Pronghorn are long-legged, small-bodied artiodactyls (hoofed mammal with an even number of toes on each foot). Upper parts are tan; the underpart, rump, and two bands across the neck are white. The male has two black cheek patches. Both sexes have horns, although they are larger in males. Males weigh 100 to 130 pounds, while females weigh 75 to 100 pounds. The Sonoran subspecies (*Antilocapra americana sonoriensis*) was first described by Goldman (1945) from a type specimen taken near the Costa Rica Ranch, Sonora, Mexico by Vernon Bailey and Frederic Winthrop on December 11, 1932, and is currently recognized as one of five subspecies of pronghorn (Nowak and Paradiso 1983). The Sonoran pronghorn is the smallest subspecies of *Antilocapra americana*.

The Sonoran pronghorn was listed throughout its range as endangered on March 11, 1967 (32 FR 4001) under the Endangered Species Preservation Act of October 15, 1966. Three sub-populations of the Sonoran pronghorn are currently extant, including: (1) U.S. sub-population in southwestern Arizona, (2) a sub-population in the Pinacate Region of northwestern Sonoran, and (3) a sub-population on the Gulf of California west and south of Caborca, Sonora. The three sub-populations are geographically isolated due to barriers such as roads and fences, and in the case of the two Sonora sub-populations, by distance. Critical habitat has not been designated for the pronghorn.

B. Life History

Sonoran pronghorn inhabit one of the hottest and driest portions of the Sonoran desert. They forage on a large variety of perennial and annual plant species (Hughes and Smith 1990, Hervert *et al.* 1997b, Service 1998a), and will move in response to spatial limitations in forage availability (Hervert *et al.* 1997a). Although it is theoretically possible for pronghorn to meet water requirements through forage consumption (Fox *et al.* 1997), after subtracting water required for excretion, respiration, and evaporation (approximately 50 percent), predicted water

intake from forage was not adequate to meet minimum water requirements for 14 of 20 simulated diets (Fox *et al.* 2000). Sonoran pronghorn will use water if it is available (Service 1998a).

Pronghorn consume a wide variety of plants. Fecal analysis indicated Sonoran pronghorn consume 69 percent forbs, 22 percent shrubs, 7 percent cacti, and 0.4 percent grasses (Service 1998a). However, Hughes and Smith (1990) reported cacti are the major diet component (44 percent). Consumption of cacti, especially chain fruit cholla (*Cylindropuntia fulgida*) (Pinkava 1999), provides a source of water during hot, dry conditions (Hervert *et al.* 1997b). Other important plant species in the diet of the pronghorn include pigweed (*Amaranthus palmeri*), ragweed (*Ambrosia* sp.), locoweed (*Astragalus* sp.), brome (*Bromus* sp.), and snakeweed (*Gutierrezia sarothrae*) (Service 1998a).

Sonoran pronghorn rut during July-September, and does have been observed with newborn fawns from February through May. Parturition corresponds with annual spring forage abundance. Fawning areas have been documented in the Mohawk Dunes and the bajadas of the Sierra Pinta, Mohawk, Bates, Growler, and Puerto Blanco mountains. Does usually have twins, and fawns suckle for about 2 months. Does gather with fawns, and fawns sometimes form nursery groups (Service 1998a). Hughes and Smith (1990) recorded an average group size of 2.5 animals; however, group size observed by Wright and deVos (1986) averaged 5.1, with the largest group containing 21 animals.

The results of telemetry studies in 1983-1991 indicated that Sonoran pronghorns nonrandomly use their habitats (deVos 1998). Pronghorn move from north to south or northwest to southeast, and upslope as summer progresses. Movements are most likely motivated by the need for thermal cover provided by leguminous trees and water available in succulent cacti such as chain fruit cholla (Hervert *et al.* 1997b), that are more abundant on bajadas and in the southern portion of the pronghorn's range. Home range size of Sonoran pronghorn ranged from 24.9 to 468 mi² for males and from 15.7 to 441 mi² for females (Wright and deVos 1986).

Causes of pronghorn mortality are often difficult to determine; however, some telemetered Sonoran pronghorn have been killed by coyotes, mountain lions, and bobcats. Some of these mortalities may have been influenced by dry periods, which predisposed pronghorn to predation (Service 1998a). Of 580 coyote scat examined on the Cabeza Prieta NWR, 5 contained pronghorn remains (Simmons 1969), but some or all of these remains may have resulted from scavenging carcasses. Hervert *et al.* (2000) found that the number of fawns surviving until the first summer rains was significantly correlated to the amount of preceding winter rainfall, and negatively correlated to the number of days without rain between the last winter rain and the first summer rain.

C. Habitat

Data collected from radio-collared animals and fecal pellet analysis have provided some data on habitat use by Sonoran pronghorn. All three Sonoran pronghorn sub-populations occur in

Sonoran desert scrub vegetation communities (Turner and Brown 1982). Turner and Brown (1982) discussed seven subdivisions of the Sonoran Desert, two of which encompass the habitat of Sonoran pronghorn in the U.S. and the Pinacate Region of Sonora (Felger 2000). These are the Lower Colorado River Valley and the Arizona Upland subdivisions. Creosote (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) are dominant perennials of the Lower Colorado River Valley subdivision. Plant species along major water courses include ironwood (*Olneya tesota*), blue palo verde (*Parkinsonia floridum*), and mesquite (*Prosopis velutina* and *P. glandulosa*). Species in the Arizona Upland include foothill palo verde (*Parkinsonia microphyllum*), catclaw acacia (*Acacia greggii*), chain fruit cholla, teddy bear cholla (*Cylindropuntia bigelovii*), buckhorn cholla (*C. acanthocarpa*), and staghorn cholla (*C. versicolor*).

On the Gulf Coast of Sonora, Mexico, pronghorn also occur in the Central Gulf Coast subdivision of Sonoran desert scrub. This form of Sonoran desert scrub is very rich in species, particularly stem succulents, but there is a general absence of a low shrub layer. Elephant tree (*Bursera microphylla*, *B. hindsiana*), sangre de drago (*Jatropha cuneata*), and *Jatropha cinerea* are common, but creosote is only locally abundant.

The habitat of the pronghorn in the U.S. consists of broad alluvial valleys separated by block-faulted mountain and surface volcanics. In December 1984, 40 percent of the pronghorn observed during a telemetry flight were in the Growler Valley, from the Aguila Mountains to the International Border. The AGFD (1985) reported that pronghorn use flat valleys and isolated hills to a greater degree than other topographic features.

Drainages and bajadas are used by pronghorn during spring and summer. Washes flow briefly after rains during the monsoon season and after sustained winter rains. The network created by these washes provides important thermal cover (shade) for pronghorn during the hot summer season. Bajadas are used as fawning areas in the spring. Pronghorn were observed using palo verde, ironwood, and mesquite for cover during weekly AGFD telemetry flights, which began in 1994 (Hervert *et al.* 1997b).

Pronghorn were observed in playas in April and May of 1988 and 1989 when forbs were abundant, later vacating these areas when desiccation of annuals occurred (Hughes and Smith 1990). In years with sufficient winter and spring precipitation, some playas produce abundant annual plant growth due to drainages into these areas.

Some of the sandy areas within pronghorn habitat such as Pinta Sands, the Mohawk Dunes west of the Mohawk Mountains, and the west side of the Aguila Mountains, provide a greater variety of seasonal vegetation when precipitation events occur. The openness of these areas appears to be attractive for pronghorn as the annuals, grasses, and shrubs provide good forage, particularly in the spring. These areas have long been considered significant pronghorn habitat in the U.S. Carr (1974) reported seeing pronghorn frequently in the Pinta Sands area. Due to the more arid nature of valley and dune habitats, annuals dry and cure, with decreased palatability for

pronghorns as summer approaches. Also, these habitats lack sufficient woody vegetation to satisfy pronghorn requirements for nutrition and thermal protection. These factors limit the temporal suitability of these areas and most pronghorn move to bajadas and washes in the southeastern portion of the range by early summer.

D. Distribution and Abundance

United States

Prior to the identification of the subspecies known as the Sonoran pronghorn (Goldman 1945), specimens of pronghorn taken within its range were identified as other subspecies (AGFD 1981). Historically, the Sonoran pronghorn ranged in the U.S. from Arizona's Highway 15 to the east; the Altar Valley and the Tohono O'odham Nation (formerly the Papago Indian Reservation) to the north; and Imperial Valley, California, to the west (Nelson 1925, Monson 1968, Wright and deVos 1986, Paradiso and Nowak 1971) (Figure 2).

During an international boundary survey conducted from 1892 through 1894, pronghorn were found in every open valley along the international boundary from Nogales, Mexico to Yuma, Arizona (Carr 1971). In 1893, Mearns (1907) reported seeing a herd of 12 pronghorn near border monument 143 in the Baboquivari Valley and small numbers in the Santa Rosa Valley near monument 161 on what is now the Tohono O'odham Nation. Nelson (1925) stated that in 1923, local people reported that a few pronghorn were still ranging in the Santa Rosa Valley. Carr (1970) noted the "sighting of eight antelope near Pisinimo on the Papago Indian Reservation which most likely drifted north from Mexico," and that "there have been numerous rumors of antelope in the Papago country"; however, no recent reliable observations are known. Carr (1970) also stated that there "is a considerable amount of good Sonoran antelope habitat on the Papago Indian Reservation and particularly in the Great Plains area. However, Indian hunting and grazing practices prohibit a lasting resident antelope population." In 1894, pronghorn were abundant near monuments 178 and 179, and westward to Tule Well (Mearns 1907). In February 1894, Mearns observed them in the Lechuguilla Desert, as well. In the Colorado Desert (presumably west of the Gila and Tinajas Altas mountains), Mearns (1907) reported that pronghorn were not abundant. He observed pronghorn tracks in California at Gardner's Laguna, 6 miles south of monument 216, and 37 miles west of the Colorado River; and then again at Laguna Station, 7 miles north of monument 224 and 65 miles west of the Colorado River.

While Mearns (1907) suggested that pronghorn may have been common in some areas in the late 1800s, evidence suggests sub-population size declined dramatically in the early 20th century. Sub-population estimates for Arizona, which began in 1925, have never shown the pronghorn to be abundant (Table 2).

Repeatable, systematic surveys were not conducted in Arizona until 1992. Since 1992, Sonoran pronghorn in the United States have been surveyed biennially (Bright *et al.* 1999, 2001) using aerial line transects (Johnson *et al.* 1991). Sub-population estimates from these transects have

been derived using three different estimators (Table 3); currently the sightability model (Samuel and Pollock 1981) is considered the most reliable estimator (Bright *et al.* 1999, 2001). The sightability model involves calculating sighting rates by group size using Sonoran pronghorn groups with radio-collared animals that were either observed or missed during previous surveys. Sightability population estimates were subsequently calculated for all survey years, 1992-2000, and are the sub-population estimates for these years that are shown in Table 3 (Bright *et al.* 1999, 2001; J. Bright, AGFD, pers. comm. 2001). Table 3 presents observation data from transects and compares estimates derived from the three population models from 1992 through 2000.

Occasional sightings of pronghorn are recorded outside of the range defined by telemetry locations in Figure 3. For instance, a possible pronghorn sighting occurred east of Aztec and north of Interstate 8 in 1990 (Service 1998a). Two adult pronghorn were observed in 1990 (Service 1998a) in the northern San Cristobal Valley approximately 5 miles southeast of Mohawk Pass in the Mohawk Mountains. In 1987, a Border Patrol agent reported a pronghorn on the Tohono O'odham Nation, this sighting was not confirmed.

Bright *et al.* (2001) defined the present U.S. range of the Sonoran pronghorn as bounded by U.S. Interstate 8 to the north, the International Border to the south, the Copper and Cabeza Mountains to the west, and State Route (SR) 85 to the east. This area encompasses 2,508 mi² (Bright *et al.* 2001). Based on pronghorn location records from 1994-2001 (Figure 3), locations of pronghorn from 1983-1995, and observations by Carr (1972) and Hall (1981), pronghorn are believed to occur most frequently in the following areas: Pinta Sands, Growler Valley, Mohawk Valley, San Cristobal Valley, and between the Growler and Little Ajo Mountains (Daniel's Arroyo area). Wright and deVos (1986) stated that observations in the Growler Valley were frequent and that the Mohawk Valley, San Cristobal Valley, and BMGR support herds of 10 to 20 animals during most of the year. Also mentioned was a regularly observed herd of 7 to 10 pronghorn in the Cameron tank area on BLM lands near Ajo.

Although observations of pronghorn were common along and east of SR 85 many years ago, Sonoran pronghorn have not been confirmed east of State Route 85 (SR 85) in Organ Pipe Cactus NM since 1972. The lack of recent observations east of the highway indicates that this heavily-used road currently poses a barrier to eastward movement. On June 12, 1996, however, an adult doe pronghorn was observed running west off the right-of-way at the approach of a vehicle on the north end of the Crater Range (R. Barry, Luke AFB, pers. comm. 1996). There also exists an unconfirmed report of four Sonoran pronghorn attempting to cross SR 85 in August 1993 approximately 1 mile north of the Organ Pipe Cactus NM visitor center. A juvenile crossed the highway (two lanes) to the east, but with the approach of a vehicle, ran back across the road to rejoin a group of three pronghorn (T. Ramon, Organ Pipe Cactus NM, pers. comm. 1993).

In recent years, the Tohono O'odham Nation has not been accessible to state and Federal biologists to survey for Sonoran pronghorn. A Border Patrol agent reported a pronghorn on the Nation lands in 1987 (Service 1998a), although unconfirmed, this is the last report of Sonoran

pronghorn on the Nation. There are no recent records of pronghorn south of the Nation in Sonora. Carr (1970) reported that hunting and grazing on the Nation was not compatible with maintaining a viable population of pronghorn. Phelps (1981) reported that pronghorn had not been observed on the Nation for 10 years. These observations suggest that pronghorn are likely extirpated from the Nation and adjacent areas.

The sightability model population estimates from 1992 to 2000 show an alarming 45 percent decrease in sub-population size (Table 3). The estimates indicate a steady decline in sub-population size, with the exception of the 1994 survey. The 1994 estimate may be somewhat inflated due to inconsistencies in survey timing (Service 1998a, Bright *et al.* 2001). The 1994 survey occurred in March (whereas those of other years occurred in December) and therefore the number may be slightly inflated because of the sightability of pronghorn at this time of year (J. Morgart, Service, pers. comm. 2001). Different population models may result in divergent estimates. Therefore, the inclusion of estimates obtained prior to 1992 in the analysis of population trends is not reasonable.

Some researchers believe that the number of pronghorn observed on transects is more statistically valid for the evaluation of population trends than estimates generated by population models (Johnson *et al.* 1991, Hervert *et al.* 1997a). The number of pronghorn observed on transects decreased by 32 percent from 1992 to 2000 (Table 3). Contrary to the sightability model estimate, the number of pronghorn observed on transects showed only a minor increase, while the total number of pronghorn sighted actually decreased in 1994 compared to the 1992 survey. High fawn mortality in 1995 and 1996 and the death of half (8 of 16) of the adult, radio-collared pronghorn during the 13 months preceding the December 1996 survey suggests that the decline was real. Five consecutive six-month seasons of below normal precipitation (summer 1994 through summer 1996) throughout most of the Sonoran pronghorn range, likely contributed, in part, to observed mortality (Bright *et al.* 2001, Hervert *et al.* 1997b).

In 1996, a workshop was held in which a population viability analysis (PVA) was conducted for the U.S. sub-population of Sonoran pronghorn (Defenders of Wildlife 1998). A PVA is a structured, systematic, and comprehensive examination of the interacting factors that place a population or species at risk (Gilpin and Soulé 1986). For the Sonoran pronghorn PVA, these factors included impacts of inbreeding, fecundity, fawn survival, adult survival, impacts of catastrophes, harvest, carrying capacity, and numbers and sex/age composition of the present population. Based on the best estimates of demographic parameters at the time, the likelihood of extinction of Sonoran pronghorn was calculated as 1 percent in the next 25 years, 9 percent in the next 50 years, and 23 percent in the next 100 years. More severe threats include population fluctuation, periodic decimation during drought (especially of fawns), small present population size, limited habitat preventing expansion to a more secure population size, and expected future inbreeding depression.

Furthermore the PVA suggested that the current pronghorn population is extremely sensitive to fawn mortality, with the likelihood of extinction increasing markedly when fawn mortality

exceeds 70 percent. Thus, a 30 percent fawn crop (30 fawns/100 does) each year is necessary to ensure the continuance of the population. This level of reproductive success has only been achieved in two of the last nine years. Fawn survival is correlated with precipitation (Hervert *et al.* 1997). With above average precipitation in 1998, 33 fawns per 100 does were produced (Bright *et al.* 2001). With similar conditions in the 2000-2001 season, a significant fawn crop is anticipated; and as of August 2001, an estimated 30-60 fawns are surviving. However, we continue to be concerned about the dramatic response of the U.S. pronghorn sub-population to seasonal or short-term drought and the possible effects of a longer-term or more serious drought, such as what occurred in the 1890s and 1950s (Rowlands 2000).

Mexico

Historically, Sonoran pronghorn ranged from the Arizona border south to Hermosillo and Kino Bay, west to at least the Sierra del Rosario, and east to the area south of the Baboquivari Valley on the Tohono O'odham Nation. The distribution in Baja California Norte is less clear, but observations by Mearns (1907) indicate they occurred in the Colorado Desert west of the Colorado River, as well. Nelson (1925) reported that a few herds in northwestern Sonora, Mexico, moved back and forth across the Arizona border. Ben Tinker reportedly counted 595 pronghorn in Sonora in November 1924 (Carr 1974). The herds counted by Carr ranged from the southern end of the Sierra del Rosario, south and east to the Sierra Blanca and the Rio Sonoyta, to the eastern side of the Sierra de San Francisco. On the basis of sightings and confiscated specimens, Monson (1968) stated that the Sonoran pronghorn persisted in some localities along the east side of the Pinacate Lava Flow southward to about 185 miles south near Guaymas.

In Mexico, Sonoran pronghorn currently range west of Highway 8 near the Pinacate Lava flow, and south and west of Caborca. In 2001, a park ranger at Pozo Nuevo, El Pinacate y Gran Desierto de Altar Biosphere Reserve (El Pinacate), reported that pronghorn have been seen in recent years west of Volcan Pinacate to the Pozo Nuevo area, and reportedly use a cement cattle trough north of Pozo Nuevo (J. Rorabaugh, pers. comm. 2001).

Sub-populations of Sonoran pronghorn in Mexico had not been exhaustively surveyed until all suitable habitat within the current known range of the Sonoran pronghorn in Mexico was surveyed in December 2000 (Bright *et al.* 2001). Although the 1993 estimate was approximate, survey results suggested a decline in the sub-population of 16 percent from 1993 to 2000 (Table 4). The December 2000 estimate was 346 individuals. This estimate, together with the 2000 U.S. estimate, brings the total estimated size of the U.S. and Mexico Sonoran pronghorn populations to approximately 445 individuals (J.L. Bright *et al.*, AGFD, unpubl. data).

Although the Sonoran pronghorn sub-population in Mexico declined approximately 16 percent from 1993 to 2000, the decrease was not experienced equally across pronghorn range. Sonoran pronghorn habitat in Mexico is bisected by Highway 8. The sub-population southeast of Highway 8 remained stable or even increased slightly between 1993 and 2000 (Table 5). Forage conditions in 2000 were notably better in this area than the rest of Sonoran pronghorn range in

Mexico and the U.S. (J. L. Bright *et al.*, AGFD, unpubl. data). The sub-population west of Highway 8 ranges throughout suitable habitat on and surrounding Volcan Pinacate, and is adjacent to the U.S. sub-population. Mexico Highway 2 (and to a lesser extent the international boundary fence) acts as a barrier to movement between El Pinacate and U.S. sub-populations. The El Pinacate sub-population declined by approximately 73 percent between 1993 and 2000 (Table 5). Dry periods and associated poor forage conditions, likely exacerbated by extensive livestock grazing, may have figured prominently in the significant decline observed in the El Pinacate sub-population. Loss of the El Pinacate sub-population would result in further fragmentation and isolation of the remaining pronghorn sub-populations in the U.S. and Mexico. Portions of Highway 8 are not fenced. Pronghorn moving across Highway 8 to the southeast may also be an explanation for the changes in these sub-populations' sizes. Between 1993 and 2001, Highway 8 was widened and improved, increasing traffic and probably increasing its effectiveness as a barrier to pronghorn movement. The U.S. sub-population has experienced good fawn production and survival thus far in 2001; we do not know whether similar fawn production and survival is occurring in the Sonoran sub-populations in Mexico.

E. Threats

Barriers that Limit Distribution and Movement

Sonoran pronghorn require vast areas of unencumbered open range to meet their annual needs for survival and reproduction. This includes the ability to freely travel long distances between localized, seasonally sporadic rainfall events in search of forage. Highways, fences, railroads, and irrigation canals can block these essential movements. Highway 2 in Mexico runs parallel to the southern boundary of Cabeza Prieta NWR and divides the range of the pronghorn between the U.S. and El Pinacate sub-populations. This highway supports a considerable amount of fast-moving vehicular traffic, and is fenced along its length, so is likely a substantial barrier to Sonoran pronghorn. In 1999, Dr. Rodrigo Medellin of Instituto de Ecologia, reported that Sonora, Mexico is planning to widen and improve Highway 2 to four lanes, which would further reduce the likelihood of pronghorn crossing the highway.

Both Cabeza Prieta NWR and Organ Pipe Cactus NM maintain boundary fences along the border. At the southern boundary of Cabeza Prieta NWR, a seven-strand livestock fence continues to be a substantial barrier to pronghorn. Modifying the fences along the U.S./Mexico border to allow pronghorn passage could aid in maintaining genetic diversity if sufficient pronghorn movement occurred. It may, however, also lead to increased pronghorn fatalities from motorized traffic on Highway 2. Mexico has been involved in discussions regarding the fences, as any modifications could potentially affect pronghorn sub-populations in both countries. Sonoran pronghorn habitat in Mexico is also bisected by Highway 8 between Sonoyta and Puerto Peñasco. This highway is bordered by a livestock fence and receives considerable tourist traffic. A less-traveled highway runs from Puerto Peñasco to Caborca.

Between Gila Bend and Lukeville, Arizona, SR 85 appears to be a barrier preventing pronghorn from dispersing eastward from their current range. Traffic volume and average speeds have increased substantially over the last 30 years as international trade and tourism have increased. The Arizona Department of Transportation increased the posted speed limit on SR 85 from 55 to 65 miles per hour (mph) in 1997, and 85th percentile traffic speed has increased from 68-71 mph in the same period (Organ Pipe Cactus NM 2001). This highway corridor is unfenced in Organ Pipe Cactus NM, allowing potential free movement of pronghorn and other wildlife, but has livestock fencing on both sides for most of the remaining mileage on BLM, Department of Defense (DoD), and private lands between Interstate 8 and Organ Pipe Cactus NM. Interstate 8, the Wellton-Mohawk Canal, agriculture, a railroad, and associated fences and human disturbance near the Gila River act as barriers for northward movement of pronghorn. De-watering of much of the Sonoyta River and barriers to pronghorn accessing the Gila River, such as Interstate 8 and the Wellton-Mohawk Canal, have caused significant loss of habitat and loss of access to water (Wright and deVos 1986). Agricultural, urban, and commercial development at Sonoyta, Puerto Penasco, and San Luis, Sonora, and Ajo, Yuma, and along the Gila River, Arizona, have removed habitat and created barriers to movement. BLM grazing allotment fences in the Ajo area may have been a barrier to movement, but were modified after 1997 to allow safe passage of pronghorn (BLM, *in litt.* 2000). Fences between the BLM lands and Organ Pipe Cactus NM and Cabeza Prieta NWR are also designed to allow passage of pronghorn.

Historically, pronghorn occurred in the Lechuguilla Desert and in low numbers in the Colorado Desert to the west of the Gila and Tinajas Altas mountains (Mearns 1907). No apparent barrier to movement from their current range to the Lechuguilla Desert exists. Interstate 8, Mexico Highway 2, and the Gila and Tinajas Altas mountains form a substantial barrier to movement between the Lechuguilla Desert and the Yuma Desert; however, pronghorn could potentially use Tinajas Altas pass as a corridor through the mountains.

Human-caused Disturbance

A variety of human activities occur throughout the range of the pronghorn that have the potential to disturb pronghorn or its habitat, including livestock grazing in the U.S. and Mexico; military activities; recreation; poaching and hunting; clearing of desert scrub and planting of buffleggrass in Sonora; dewatering and development along the Gila River and Rio Sonoyta; increasing undocumented migrant and drug trafficking along the international border and associated law enforcement response; and roads, fences, canals, and other man-made barriers.

Studies of captive pronghorn, other than the Sonoran subspecies, have shown that they are sensitive to disturbance such as human presence and vehicular noise. Human traffic, such as a person walking or running past pronghorn in an enclosed pen, a motorcycle driving past, a truck driving past, a truck blowing its horn while driving past, or a person entering a holding pen, caused an increased heart rate response in American pronghorn in half-acre holding pens (Workman *et al.* 1992). The highest heart rates occurred in female pronghorn in response to a person entering a holding pen, or a truck driving past while sounding the horn. The lowest heart

rates occurred when a motorcycle or truck was driven past their pen. Other investigators have shown that heart rate increases in response to auditory or visual disturbance in the absence of overt behavioral changes (Thompson *et al.* 1968, Cherkovich and Tatoyan 1973, Moen *et al.* 1978).

A pronghorn can canter effortlessly at 25 mph, gallop without straining at 44 mph, and run flat out at speeds of 55-62 mph (Byers 1997). During an aerial reconnaissance, one herd of Sonoran pronghorn was observed 12 miles away from the initial observation location 1.5 hours later (Wright and deVos 1986). Hughes and Smith (1990) found that pronghorn immediately ran 1,310-1,650 feet from a vehicle and that military low-level flights (<500 feet AGL) over three pronghorn caused them to move about 330 feet from their original location. Krausman *et al.* (2001) examined effects of ground-based and aircraft military activities on Sonoran pronghorn at the North and South TACs at the BMGR and concluded that behavioral patterns were similar with and without presence of military stimuli. Military activities, both ground-based and aerial, were associated with some changes in behavior (e.g., from standing to trotting or running, or bedded to standing) but the authors concluded that these changes were not likely to be detrimental to the animals. Eighty-seven (4.1 percent) of the 2,128 events with ground-based stimuli resulted in pronghorn changing their behavior to trotting or running; a total of 866 (41 percent) resulted in some change in behavior. Krausman *et al.* (2001) documented 149 direct overflights and 263 other overflights (in which the aircraft passed ≥ 328 feet to the side of the animal). Pronghorn changed their behavior 39 and 35 percent of the time during direct and other overflights, respectively. Unfortunately, we can not discern from Krausman *et al.* (2001) how pronghorn responded to low-level helicopter flights. No conclusions could be drawn about effects to fawns due to poor fawn productivity during the study. During times of drought, disturbances that cause pronghorns to startle and run would energetically have a more significant effect. Such energetic expenditures, particularly during times of stress, may lead to lower reproductive output and/or survival of individual animals (Geist 1971).

Livestock grazing has the potential to significantly alter pronghorn habitat (Leftwich and Simpson 1978, Kindschy *et al.* 1982, Yoakum *et al.* 1996). This is especially true in the arid Sonoran Desert. Cattle and other domestic livestock were first brought to northwestern Sonora, Mexico, in 1694 (Wildeman and Brock 2000). Overgrazing well into the 19th century by Spaniards and their descendants caused widespread habitat changes throughout much of the Sonoran Desert, particularly in more settled areas such as central Sonora, Mexico (Sheridan 2000).

American ranchers were running livestock by the early 1900s in much of the area that would later become Organ Pipe Cactus NM (Rutman 1997) and Cabeza Prieta NWR (Cabeza Prieta NWR files). Because there was no international boundary fence until 1947, livestock from both the U.S. and Mexico ranged freely across the border (Rutman 1997). Rutman (1997) estimates 1,000 head of burros and horses were present in 1942 on the southern half of Organ Pipe Cactus NM, and as many as 3,000 cattle on Organ Pipe Cactus NM at one time. Cattle were removed from Organ Pipe Cactus NM, Cabeza Prieta NWR, and the BMGR in 1979, 1983, and 1986,

respectively (Service 1998a, Rutman 1997). Grazing continues to be an important use of former pronghorn habitat on the Tohono O'odham Nation. Wright and deVos (1986) stated that poor habitat conditions (caused in part by livestock grazing) still appeared to be the leading cause in the decline in Sonoran pronghorn numbers. In Sonora, livestock grazing occurs in ejidos (community ranches or farms) and other ranch lands throughout much of the range of the pronghorn. Cattle range farther in years with abundant annual growth, and are more limited to areas near water during hot and dry periods and seasons. In Arizona, cattle grazing continues on lands administered by the BLM in currently occupied pronghorn habitat near Ajo, Why, and Sentinel. The BLM is in the process of performing allotment analyses on these areas in terms of their current conditions and ongoing uses to determine if grazing is in compliance with the Arizona standards for rangeland health. If current grazing practices prove to be a factor in these areas not meeting established standards, then the BLM must change grazing through the permitting process to ensure significant progress is made towards achieving standards as required by grazing regulation 43 CFR 4180, and the Lower Gila South Resource Management Plan, as amended. Telemetry data indicate little use of BLM lands by pronghorn, despite the recent modification to BLM fences to make them pronghorn-friendly. The lack of pronghorn on BLM lands may be due to the more long-term effects of grazing in changing vegetation amount and type, thus reducing the suitability of the habitat for pronghorn.

Mining occurred historically throughout much of the U.S. range of the pronghorn. Miners probably hunted pronghorn and disturbed habitat locally. No mining occurs now on the BMGR, Cabeza Prieta NWR, or Organ Pipe Cactus NM. The open pit and associated tailings piles at the Phelps Dodge copper mine at Ajo eliminated habitat in that area (MCAS-Yuma 2001, Organ Pipe Cactus NM 2001).

Illegal crossings by undocumented migrants and drug smuggling in the U.S. range of the pronghorn has increased dramatically in recent years. Deportable migrant apprehensions by Border Patrol agents in the Ajo Station increased steadily from 9,150 in 1996 to 20,340 in 2000. A total of 25,074 pounds of marijuana were apprehended by Ajo Station agents in 2000 (U.S. Immigration and Naturalization Service 2001). In 2001, estimates of undocumented migrants traffic reached 1,000 per night in Organ Pipe Cactus NM alone (Organ Pipe Cactus NM 2001). These activities and Border Patrol response have resulted in widespread habitat degradation and increased human presence in remote areas. Increased presence of Border Patrol in the Douglas, Arizona area, and in San Diego (Operation Gatekeeper) and southeastern California, have pushed undocumented migrant traffic into remote desert areas, such as Cabeza Prieta NWR, Organ Pipe Cactus NM, and the BMGR (Klein 2000).

Small Population Size and Aging Demographics

A possible minimum viable population for pronghorn is 50 animals (Reed *et al.* 1986, Scott 1990). To maintain genetic diversity, a population of at least 500 is desirable (Defenders of Wildlife 1998). The U.S. sub-population, even assuming significant recruitment this year, is well below 500 and is dangerously close to 50. At 34, the Pinacate sub-population is below the

possible minimum viable population. Populations at low levels may experience random variations in sex ratios, age distributions, and birth and death rates among individuals, which can cause fluctuations in population size and possibly extinction (Richter-Dyn and Goel 1972). The sex ratio is currently skewed in favor of females (male:female ratio of 63:100 [Bright *et al.* 2001]) which is advantageous in regard to reproductive potential. However, a scenario in which males outnumber females by a similar margin is just as likely. In very sparse populations, males may have trouble finding females, reducing productivity (Ehrlich and Roughgarden 1987). Small populations are also sensitive to variations in natural processes, such as drought and predation (Hecht and Nickerson 1999).

Of additional concern is the age of individual pronghorns in the U.S. sub-population. Because of limited recruitment over the last seven years, approximately 56 percent of the sub-population is more than six years of age. Pronghorn rarely live more than nine years, thus we can expect the majority of the current adult population to die in the next two to three years (Bright *et al.* 2001).

F. Recovery Plan

The 1982 Sonoran Pronghorn Recovery Plan (Service 1982) was revised in 1998 (Service 1998a). The recovery criteria presented in the revised plan entailed the establishment of a population of 300 adult pronghorn in one self-sustaining population for a minimum of five years, as well as the establishment of at least one other self-sustaining population in the U.S. to reclassify the subspecies to threatened.

Actions identified as necessary to achieve these goals included the following: (1) enhance present sub-populations of pronghorn by providing supplemental forage and/or water; (2) determine habitat needs and protect present range; (3) investigate and address potential barriers to expansion of presently used range and investigate, evaluate, and prioritize present and potential future reintroduction sites within historic range; (4) establish and monitor a new, separate herd(s) to guard against catastrophes decimating the core population, and investigate captive breeding; (5) continue monitoring sub-populations and maintain a protocol for a repeatable and comparable survey technique; and (6) examine additional specimen evidence available to assist in verification of taxonomic status.

In February 2001, the D.C. Federal District Court ordered the Service to reassess Sonoran pronghorn recovery criteria and to provide estimates of time required to perform recovery actions detailed in the 1998 plan. In response, a supplement and amendment to the 1998 Final Revised Sonoran Pronghorn Recovery Plan was prepared (Service 2001). The Service concluded that given the nature of the current threats, unknown elements of pronghorn life history and habitat requirements, uncertainty of availability of suitable reintroduction sites and animals for transplants, internal and external resistance to pro-active management actions on wilderness and other areas of the public lands, and continuing uncertainty regarding the long-term stability and status of sub-populations in Mexico, the data do not yet exist to support establishing delisting criteria. Tasks necessary to accomplish reclassification to threatened status (as outlined in the

1998 plan) should provide the information necessary to determine if and when delisting will be possible and what the criteria should be.

As outlined in the supplement, recovery efforts should focus on: (1) improving habitat for fawn survival and recruitment through the establishment and evaluation of forage enhancement plots on the BMGR; (2) initiating a quantitative evaluation of pronghorn use and reliance on sources of free water (temporary and permanent); (3) reducing predation through the selective removal of coyotes from specific areas and at times of the year when adult female pronghorn are most susceptible to predation; (4) evaluating potential transplant locations, establishing relocation methodology and protocols, developing interagency agreements (including with Mexico as required), acquiring funding, and initiating a reintroduction; (5) increasing frequency and expanding scope of aerial monitoring in Mexico to improve comparability with U.S. surveys; and (6) investigating potential pronghorn disease vectors.

III. ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, state, or private actions in the action area; the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation; and the impact of state and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform from which to assess the effects of the action now under consultation.

A. Action Area

The "action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. Within the U.S. portion of the Sonoran pronghorn's range, pronghorn interact to form one population in which interbreeding may occur. The U.S. population is effectively separated from populations in the Pinacate Region and on the Gulf Coast of Sonora by Mexico Highway 2 and the U.S.-Mexico boundary fence. Activities that may affect animals in any portion of the U.S. range of the pronghorn may affect the size or structure of the U.S. population, or habitat use within the U.S. range. The action area for this biological opinion is defined as the range of the pronghorn within the U.S. (Figure 3), plus the five grazing allotments. Although this entire area is affected, at least indirectly, by the proposed action, effects are most evident where BLM activities occur within the five allotments, particularly Cameron, Why, Coyote Flat, and the portion of Childs west of SR 85.

Management of the action area is almost entirely by Federal agencies. The largest area, the BMGR (nearly 2 million acres) is managed by Luke AFB and MCAS-Yuma primarily for military training. Recent legislation will remove the BLM from natural resources management on the BMGR in November 2001, at which time natural resources will be managed by MCAS-Yuma (western portion) and Luke AFB (eastern portion) in accordance with the Sikes Act. Organ Pipe Cactus NM manages 329,000 acres in the southeastern corner of the action area for

scenic, ecological, natural, and cultural values. Cabeza Prieta NWR lies along the border west of Organ Pipe Cactus NM and encompasses 860,000 acres. Cabeza Prieta NWR is managed to protect, maintain, and restore the diversity of the Sonoran desert. The BLM manages lands near Ajo (four allotments totaling 191,740 acres) and Sentinel (one allotment totaling 21,876 acres), for multiple use in accordance with the Lower Gila Resource Management Plan.

B. Terrain, Vegetation Communities, and Climate in the Action Area

The action area is characterized by broad alluvial valleys separated by block-faulted mountains and surface volcanics. The Yuma Desert on the western edge of the BMGR is part of a broad valley that includes the Colorado River. It is bordered on the east by the Gila and Tinajas Altas mountains. To the east of these mountains are a series of basins and ranges; from west to east these include the Lechuguilla Desert; the Cabeza Prieta and Copper Mountains; the Tule Desert and Mohawk Valley, including the Mohawk Dunes and Pinta Sand Dunes; the Sierra Pinta, Mohawk, and Bryan mountains; the San Cristobal Valley; the Aguila and Granite mountains; the Growler Valley; the Crater Range, Growler, Bates, and Agua Dulce mountains; and the La Abra Plain and Puerto Blanco Mountains west of SR 85. Elevations range from 180 feet in the southwest corner of the BMGR to 3,294 feet in the Growler Mountains. Major drainages and mountain ranges run northwest to southeast. The mountains are of two major types: a sierra type, composed of metamorphic and granitic rock, and a mesa type, typically of basaltic composition. Major drainages flow mostly northward to the Gila River, although southern portions of Organ Pipe Cactus NM and the southern slope of the Agua Dulce Mountains drain south to the Rio Sonoyta, Sonora.

Climate is characterized by extreme aridity, mild winters, and hot summers. Approximately 2.7 inches of precipitation fall annually at Yuma, with slightly more than half of this occurring in the winter months (Turner and Brown 1982). Annual precipitation increases from west to east across the BMGR; at Aguajita/Quitobaquito, precipitation is 10.5 inches annually. Infrequent chubascos (tropical storms) bring heavy rains in September or October that can produce spectacular growth on warm-season perennial plants (Felger 2000).

The vegetation community of the western portion of the BMGR has been classified as the lower Colorado River Valley subdivision of Sonoran Desert scrub (Turner and Brown 1982). It is the largest and most arid subdivision of Sonoran Desert scrub. Vegetation in the valleys, particularly in the Yuma Desert, is dominated by the creosote-white bursage series of Sonoran desert scrub (Turner and Brown 1982). This series occupies approximately three-fourths of the lowland or valley areas in the BMGR (Reichenbacher and Duncan 1989). In this series, creosote and white bursage are often co-dominants, with galleta grass (*Hilaria rigida*), dalea (*Psoralemmun emoryi*), coldenia (*Tequilia plicata*) and other locally abundant species. Distinctive floras are also found in dunes in the area, particularly in the Yuma Dunes west of the Tinajas Altas Mountains, at Pinta Sands, and at the Mohawk Dunes. Species such as dune buckwheat (*Eriogonum deserticola*), mormon tea (*Ephedra trifurca*), dicoria (*Dicoria canescens*), dune spurge (*Euphorbia platysperma*), the threatened Peirson's milkvetch (*Astragalus magdalenae*

peirsonii), and wire lettuce (*Stephanomeria schottii*) are found in one or more of these dune habitats. These species are dune specialists typical of the Gran Desierto dunes in northwestern Sonora (Felger 2000).

In drainages, bajadas, and montane habitats (including the Mohawk, Cabeza Prieta, Granite, and the Sierra Pinta Mountains), the mixed scrub series of the lower Colorado River subdivision (Turner and Brown 1982) is found. This community is more diverse than the creosote-bursage series and includes species more representative of the Arizona Upland subdivision of Sonoran Desert, such as palo verde, saguaro (*Carnegie gigantea*), ironwood, and desert lavender (*Hyptis emoryi*), among others. Frost-sensitive species such as elephant tree, limber bush, and Mexican jumping bean (*Sebastiania biloculare*) are also found in this community, but are more representative of species and genera of the Central Gulf Coast subdivision of Sonoran Desert scrub found to the south in Sonora (Dames and Moore 1995, Turner and Brown 1982).

The Arizona Upland subdivision of Sonoran Desert scrub is found in the Growler, Puerto Blanco, and Bates mountains, and surrounding bajadas. Vegetation in this community takes on the appearance of a scrubland or low woodland of leguminous trees, shrubs, and cacti. The woodland component is most developed and species richness is greatest in drainages. In the action area, common trees of the Arizona Upland include palo verdes, ironwood, catclaw acacia, and velvet mesquite (*Prosopis velutina*). Dominant cacti include saguaro, chain fruit cholla, teddy bear cholla, and organ pipe cactus. Senita cactus (*Lophocereus schottii*) more common to the south in Mexico, is found in the southern portion of Organ Pipe Cactus NM and the Agua Dulce Mountains, Cabeza Prieta NWR. Vegetation on Cabeza Prieta NWR, Organ Pipe Cactus NM, and most of the BMGR is largely undisturbed by human activities.

Rutman's (1996) assessment of accelerated erosion at Organ Pipe Cactus NM implicates several historic and on-going sources of erosion, including the continued grazing and recreational use on the Ajo allotments. Aerial photographs show gullies and headcutting originating on BLM land and working towards Organ Pipe Cactus NM, as well as the denuded or nearly denuded area near Rasmussen Tank (north of the Organ Pipe Cactus NM boundary) (Rutman 1996). Rutman (1996) suggests the condition of the area near Rasmussen Tank has resulted in "large flows of water being delivered to Cuerda de Lena and Kuakatch Wash." In addition to the increase in runoff resulting from the condition of the Rasmussen Tank area, Rutman (1996) describes the effects of grazing on the Cuerda de Lena and Organ Pipe Cactus NM's concerns for continued grazing: "Grazing along Cuerda de Lena on BLM land has caused the development of vertical cutbanks just north of the monument. In 1995, these banks were chiselled by cattle hooves. Trees in the riparian zone were hedged by shade- and forage-seeking cattle and understory vegetation was lacking or sparse. These conditions signal resource overuse, a situation that could significantly affect the monument if the current permitted stocking rate and grazing system are maintained." (See photographs, Appendix 2)

BLM has collected utilization data on four of the five allotments, and provided data for the Cameron, Why, and Coyote Flat allotments to the Service for the years 1992-2001 (as an

attachment to the BLM's November 7, 2001, memo to the Service) and for the Sentinel Allotment during 1989-1994 (the Sentinel Allotment has been in non-use from 1995-2001). Utilization data have not been collected on the Childs Allotment. For some years and in some areas of the other allotments utilization was not monitored (e.g. 1994-1997 on Cameron). Utilization data are collected on transects and at key management areas (KMAs). KMAs are selected based on "location, grazing use, and value as a monitoring point for grazing use" and, if selected properly, represent the "overall acceptability of current grazing management over the entire range" (BLM unpubl. report). Monitoring data for all years monitored, except 2001, on the Cameron and Coyote Flat allotments, and 1993-1994 on the Sentinel Allotment, showed utilization rates below the target of 40 percent for the three allotments (Table 6). Utilization rates as high as 54 percent on the Sentinel Allotment in 1993-1994 are probably incorrect and attributable to inexperienced observers, according to BLM. On the Cameron Allotment, the highest utilization recorded from 1990-2000 was 10 percent on bush muhly in 2000. On the Why Allotment, utilization from 1998-2001 did not exceed 2.5 percent on any species in KMAs. However, in 2001 utilization exceeded 40 percent in three of seven KMAs on the Cameron Allotment and was as high as 77 percent on chuparosa (*Justicia californica*) at one KMA. On the Coyote Flat Allotment in 2001, utilization exceeded 40 percent on one of three KMAs, and reached 43 percent on galleta grass (*Hilaria rigida*).

The BLM has also conducted rangeland surveys on the Cameron, Childs, Why, and Coyote Flat allotments, which includes an analysis of range condition and trend based on the comparisons of a site's vegetation composition and frequency to what should occur there (potential natural community - PNC) based on Natural Resource Conservation Service (NRCS) data. Sites are categorized into condition classes that correspond to community seral stages as follows (percentages are percent similarity to PNC.):

- Early seral stage (0-25 percent) (equivalent to poor range condition)
- Mid seral stage (26-50 percent) (equivalent to fair range condition)
- Late seral stage (51-75 percent) (equivalent to good range condition)
- PNC (76-100 percent) (equivalent to excellent range condition)

Rangeland survey data were collected in 1981 and 2001. At five sites evaluated on the Cameron Allotment and two nearby on Organ Pipe Cactus NM, dry weight/ground cover of grasses and forbs (both annual and perennial) were absent or lower than the estimated PNC. Current conditions on the Cameron Allotment are generally at PNC or late seral stage. On the Childs Allotment, condition is primarily late seral. Similar to the Cameron Allotment, dry weight/ground cover of forbs is lower than estimated for PNC. Grasses, particularly in 2001, were better represented than on the Cameron Allotment. On the Coyote Flat Allotment in 2001, two of the monitored sites rated as mid-seral, the third was rated at PNC. Grasses and forbs were under-represented in comparison to predicted vegetation composition at PNC. A site nearby in Organ Pipe Cactus NM rated at PNC, but grasses and forbs were also under-represented. Of two sites monitored on the Why Allotment; one site rated at PNC, the other was late seral. A site nearby at Organ Pipe Cactus NM was rated at PNC. Similar to other sites and allotments,

grasses and forbs were under-represented. Range condition trend is mostly static on the five allotments, however; trend data are based on two points in time. Discerning trends based on two points is problematic.

In a preliminary analysis of these rangeland survey data, BLM found that grass species make up a small percentage of the PNC. Grass could be missing from an ecological site and the site could still receive a high rating. At most of the KMA's, perennial grasses were observed, but the amount of perennial grasses is lower than the BLM resource specialists would expect (BLM unpubl. data). Although BLM's preliminary analysis reports that "the dry wash communities do not rate very high," it is stated that "the ecological site guides do not appear to describe these sites accurately" (BLM unpubl. report).

Vegetation transects and plots to monitor trends in density and cover of perennial plant species were established near the western boundary of the Cameron Allotment on Cabeza Prieta NWR in 1983. Similar transects were established on the Cameron Allotment in 1984. The plots and transects have been monitored several times through the 1980s and 1990s, and were monitored in 2001. In regard to a preliminary analysis of the Cabeza Prieta NWR and Cameron Allotment data, BLM describes problems interpreting the results of transects and plots due to errors, such as not consistently applying the protocols. Despite these problems, BLM believes some general trends emerge from the data: (1) total perennial cover "may have increased in some periods" but in both BLM and Cabeza Prieta NWR study areas, total perennial cover is "about the same or slightly less than the 1983-1985 period when initial readings were made," and (2) "some plant densities have varied greatly over the period" with perennial grasses increasing slightly on some BLM study areas and decreasing in others, while sites on Cabeza Prieta NWR generally "lost both grass cover and density from the beginning to the end of the period" (BLM unpubl. report). BLM further states that the decrease in grass cover and density in the Cabeza Prieta NWR study areas "may be due, in part, to many of the refuge sites occurring in heavily impacted sites near old wells and corrals" (BLM unpubl. report). To date, BLM has identified no discernible difference in trend between the study areas on Cabeza Prieta NWR and the Ajo allotments study areas.

Despite some problems with methods, the data summarized above generally show only minor changes in plant community characteristics over the last 20 years on the allotments and nearby areas of Organ Pipe Cactus NM and Cabeza Prieta NWR. Furthermore, plant communities are close to what is expected by the NRCS. However, interpretation of these utilization, rangeland survey, and perennial vegetation transect and plot data in regard to effects of grazing is unclear for a number of reasons. Desert scrub communities take a long time to recover from grazing, and deterioration of soils and vegetation communities can continue after cessation of grazing (Lovich and Brainbridge 1999). In Great Basin desert scrub plots protected from grazing for ten years showed no differences from heavily grazed areas, indicating slow recovery (Jeffries and Klopatek 1987). Exclusion of grazing for 14-19 years did not allow recovery of perennial grasses in southeastern Arizona (Roundy and Jordan 1988). Rutman (1996, 1997) describes ongoing head cuts and erosion at Organ Pipe Cactus NM that are likely attributable to grazing

that occurred before 1979. Continuation of land degradation following cessation of grazing has also been noted in the deserts of Kuwait (Omar 1991). Furthermore, comparison sites on Organ Pipe Cactus NM and Cabeza Prieta NWR where BLM collected data, have a long history of grazing, although cattle were excluded from Organ Pipe Cactus NM in 1979 and Cabeza Prieta NWR in 1986. The monitoring sites at Cabeza Prieta NWR were selected to document recovery from livestock grazing and were located in areas that received heavy grazing use, such as near corrals and waters. Sites monitored at Organ Pipe Cactus NM are near the historic Armenta Ranch where Rutman (1997) documented continuing erosion likely attributable to past grazing, and are also located between Armenta Ranch and Bates Well in an area of the Monument that received heavy livestock use more than 20 years ago. As a result, any conclusions about the effects of grazing on the BLM lands based on comparisons with "ungrazed" areas of Organ Pipe Cactus NM and Cabeza Prieta NWR are probably not very meaningful. In addition, because of a lack of reference sites in this area of southern Arizona that have never been grazed, deriving the composition of a PNC for this area is suspect, at best. Thus, any analysis of how current conditions compare to this hypothetical PNC are questionable. There is also some evidence that areas of Organ Pipe Cactus NM and Cabeza Prieta NWR have recovered to some degree from past grazing and/or other land uses are causing visible differences among the lands of these three jurisdictions. Yet these differences are not reflected in the BLM data set.

C. Status of the Sonoran Pronghorn in the Action Area

Distribution

Figure 3 illustrates records of Sonoran pronghorn in Arizona from 1994-2001. Based on these locations and observed locations of pronghorn from 1983-1993, pronghorn are believed to occur most frequently in the following areas: Pinta Sands, Growler Valley, Mohawk Valley, San Cristobal Valley, and between the Growler and Little Ajo Mountains (Daniel's Arroyo area). All localities from 1994-2001 are south of Interstate 8, east of the Copper and Cabeza Prieta mountains, and west of SR 85 (Bright *et al.* 2001). Habitat north of Interstate 8 has not been surveyed to any extent for pronghorn, but habitat in this area is highly fragmented. Interstate 8 and the Wellton-Mohawk Canal are probably barriers to movement of pronghorn.

On Cabeza Prieta NWR, pronghorn groups were most often observed on the southwestern edge of the Sierra Pinta Mountains and in the Pinta Sands, in the valley between the Sierra Pinta and Bryan Mountains, in the San Cristobal and Growler valleys, and near Daniel's Arroyo. At Organ Pipe Cactus NM, pronghorn were most often observed near Acuna and Bates wells, and west of the Bates Mountains and Cipriano Hills. On the BMGR, concentrations of animals were observed near HE Hill on South TAC, with scattered sightings through the San Cristobal Valley and into the Mohawk Valley. John Hervert (AGFD, pers. comm. 1996) also believes that pronghorn frequent the northern portion of the Agua Dulce Mountains. Pronghorn may have used the Pinta Sands area to a greater degree in the early 1970s (AGFD 1981).

Pronghorn often seek the thermal cover found in the Arizona Upland subdivision of Sonoran desert scrub during the hot, dry summer months. This cover is best developed in the southeastern portion of their range in Arizona. With the onset of summer rains or cooler temperatures, pronghorn may move to the more open valleys and flats, such as the Growler Valley and Pinta Sands. Rocky, mountainous terrain, such as the slopes of the Growler or Mohawk Mountains, is not considered habitat for the Sonoran pronghorn (deVos 1990); however, pronghorn may be found on lower slopes and in associated washes (L. Thompson-Olais, Service, pers. comm. 1996).

Telemetry data collected by the AGFD between 1994 and 2001 reports observation of radio-collared Sonoran pronghorn on the Cameron Allotment in 1995, 1996, and 1998. Locations of these data points occur in the approximate center of the allotment (1995), near the Cabeza Prieta NWR boundary fenceline (1996 and 1998), and in the vicinity of Little Ajo Mountain (1998). In 1996, an observation was reported in the northeast portion of the Sentinel Allotment.

Population Size and Dynamics

Data on the size of the U.S. population of Sonoran pronghorn is presented in Tables 2 and 3. Before 1992, population estimates were not repeatable or accurate enough to be comparable or to discern trends in population size. However, anecdotal information in historic observations suggests a real decline. Observations of Mearns (1907) in the early 1890s suggested that pronghorn were locally common in what is now Cabeza Prieta NWR. From 1925-1968, however, population estimates ranged from only 50-105 individuals. Mearns (1907) observed pronghorn in the Lechuguilla Desert, in the Colorado Desert, and on what is now the Tohono O'odham Nation, as well. The pronghorn is not known to occur in these areas today; thus populations declined and the range contracted substantially during the early 20th century.

Quantitative, repeatable estimates of population size were calculated from survey data collected in 1992, 1994, 1996, 1998, and 2000. As late as 1994, the estimated U.S. population of Sonoran pronghorn using distance sampling methods was 282 individuals. The results of an aerial survey, conducted in December 1996, suggested that the most reliable estimate (based on capture-recapture estimates using collared individuals) was 130 individuals at that time (Bright *et al.* 2001). The decrease in the population may be attributable, in part, to dry periods in 1994 (November), 1995 (summer), and 1996 (winter). Because available food was not as abundant during this period, pronghorn may have been forced to use habitat where they are more vulnerable to predation. Lack of water may also be a factor affecting the pronghorn.

In 1995, there was abundant rainfall in the spring. Productivity of Sonoran pronghorn was between 1 and 1.4 fawns per doe. In July, the proportion of fawns to does was as high as 50 percent. However, as dry conditions set in from July to December, most fawns died. Recruitment for the year was only 12 fawns per 100 does (12 percent). Dry conditions continued in 1996 and 1997, during which no fawns were known to have been recruited into the population. The heavy and steady precipitation during winter of 1997-98 produced perhaps the best annual

plant production since 1978, and good fawn recruitment occurred that year (33 fawns per 100 does). The spring of 1999 was drier than normal, and no fawns were known to have survived by December. Fawn production was 14 fawns per 100 does in 2000 (Bright *et al.* 2001). An exceptional fawn crop in 2001 of 30-60 fawns surviving as of October 2001 may reflect good precipitation in spring and summer of 2001 (J. Hervert, pers. comm. 2001). At a population viability analysis workshop conducted for the Sonoran pronghorn, recruitment at a level of 30 fawns per 100 does was deemed to be necessary for the subspecies to persist (Hervert 1996, Defenders of Wildlife 1998). Although there is a close relationship between fawn survival and precipitation, in the context of the last 100 years, the 1990s were not characterized by drought (Rowlands 2000); thus factors, in addition to precipitation, likely contributed to the population decline. However, the seasonal timing and intervals between rainfall events may be more significant than annual totals (J. Hervert, pers. comm. 2001).

Adult mortality has been high in recent years, with predator-related mortality being the most frequently identifiable cause of death. Thirty-five adult pronghorn have been radio-collared by AGFD since 1994. Of these, 22 (63 percent) have since died. A total of 11 of these mortalities were attributed to predation, while the remaining were from unknown causes. Some of the 11 mortalities attributed to unknown causes were likely caused by predation (J. Hervert, pers. comm. 1999); however, unavoidable lag times between time of death and scene investigation caused evidence to be obscured. No collared pronghorn mortalities were documented during dry periods and no evidence of predation of pronghorn was documented near water sources (Hervert *et al.* 2000). Capture myopathy (physiological condition of an animal, caused by fear, stress, and/or overexertion that sometimes manifests itself during or up to 14 days after capture and left untreated the effects can range from temporary debilitation to death) may have played a role in up to five of the mortalities in 1994 (Hervert *et al.* 2000). In the majority of documented mortalities, bone marrow condition was assessed. Only one specimen was determined to be in poor to fair condition, while all others were determined to be in good condition.

Drought

Precipitation, particularly winter rainfall, is closely associated with production of annual forage, although other factors, such as timing of precipitation, temperature, and soils are important, as well (Felger 2000, Inouye 1991). Hervert *et al.* (2000) found that the number of fawns surviving until the first summer rains was significantly correlated to the amount of preceding winter rainfall, and negatively correlated to the number of days without rain between the last winter rain and the first summer rain. Bright *et al.* (2001) concluded that low rainfall and poor forage conditions from 1994-2000 have negatively affected Sonoran pronghorn.

Rowlands (2000) examined trends in precipitation for southwestern Arizona and Organ Pipe Cactus NM from 1895-1999. For southwestern Arizona, no trend in precipitation was found for the period, but low precipitation occurred around 1895 and during the 1950s. Periods of high precipitation occurred in 1915-1920 and in the 1980s. For Organ Pipe Cactus NM, there was a slightly increasing trend in monthly and annual precipitation over the period 1895-1999, a strong

drought occurred in the 1950s, and a lesser drought occurred in the 1970s (Felger 1980 notes a 34-month period, from September 1969-August 1972, without precipitation in the Sierra del Rosario). No discernable trend in precipitation in southwestern Arizona or Organ Pipe Cactus NM was found in the 1990s, which is when the current decline in the U.S. pronghorn population began. At four stations in southwestern Arizona, Hervert *et al.* 2000 note below normal precipitation in the winters of 1995/1996 (-2.78 inches) and 1996/1997 (-2.87 inches), and wet winters in 1994/1995 (+1.97 inches) and 1997/1998 (+4.29 inches). Annual plant production was exceptional in the winter of 1997/1998 and spring of 1998. Winter of 1992/1993 and spring of 1993 also saw a very good crop of annual plants.

Organ Pipe Cactus NM (2001) examined available data on precipitation and concluded that "although substantial year-to-year variations exist, the general trend in the later 20th century has been one of slightly increasing rainfall" at Organ Pipe Cactus NM. Given that pronghorn populations survived the droughts of the 1890s, 1950s, and 1970s, it is unreasonable to solely attribute the current decline in the U.S. pronghorn population to drought. Organ Pipe Cactus NM (2001) concluded, "If (individual) recent dry years have had an impact on Sonoran pronghorn, it is most likely because in recent decades Sonoran pronghorn have much more limited options for coping with even brief moderate drought. Because of restrictions on their movements and range, and increasing human presence within their range, pronghorn are less able to employ their nomadic strategy in search of relief. It is not that drought itself is an impact, but possibly that drought has *become* an impact, due to other factors confounding the species' normal ecological strategy."

Disease

Leptospirosis is a contagious, febrile (fever) disease caused by a spirochete bacteria (*Leptospira interrogans*) that affects mammals (including humans), birds, reptiles, amphibians, and insects. The infection is usually transmitted through skin or mucous membrane contact with the urine of infected animals and by contact with soil, water, or plants that have been contaminated by infected urine. It is believed that the bacteria may live outside the host organism for up to six months under favorable conditions. In general, infections may be very mild and symptomless or may result in disease conditions, including fever, jaundice, hemoglobinuria (a disorder that destroys red blood cells, resulting in the presence of hemoglobin in the urine), renal failure, abortion, and/or death (Merck and Company 1986). Following an abortion caused by leptospirosis, fetal membranes may be retained and fertility may be impaired (Merck and Company 1986). Leptospirosis is considered a serious disease in the livestock industry. Confirmed cases of leptospirosis in the United States are relatively low, but because symptoms of the disease can be nonspecific, actual incidences of the disease may be higher.

The closely related hemorrhagic diseases, bluetongue virus (BTV) and epizootic hemorrhagic disease (EHD), are noncontagious, insect-transmitted viral diseases of wild and domestic ruminants. The biting midge (*Culicoides* sp.) is a suspected vector of the transmission of both diseases (Hoff and Trainer 1981). BTV has also been found in naturally infected cattle lice

(*Haematopinus eurysternus*) (Hoff and Trainer 1981). The viruses are associated with wet weather and/or moist, low-lying areas, which would facilitate favorable breeding conditions for the midge. New research by the U.S. Department of Agriculture, indicates that *Culicoides sonorensis* is likely the primary vector (Stelljes 1999). This species is found in the southern and western states. EHD occurs throughout the distribution of the white-tailed deer (*Odocoileus virginianus*). The diseases are sometimes difficult to distinguish from each other because symptoms and lesions are nearly identical and both viruses can be active at the same time.

Like leptospirosis, BTV is considered a serious disease in the livestock industry. According to Hoff and Trainer (1981), all evidence of disease transmission between species in the United States suggests that BTV is spread from domestic livestock to wildlife. Other experts, however, believe that it is not always possible to determine the path of transmission because there may be several species of livestock and wildlife in a given area that may act as hosts of the disease (T. Noon, Arizona Veterinary Diagnostic Lab, pers. comm. 2001). The impacts of EHD are not as clear in the livestock industry, but are obvious on free-ranging artiodactyls, causing sporadic but locally severe die-offs of white-tailed deer and occasional mortality reported in pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) (Hoff and Trainer 1981). Both diseases are often fatal in wild ruminants, causing extensive hemorrhaging. Cattle infected with BTV typically show no clinical signs, but abortion or the birth of abnormal calves may occur if the cow becomes infected during gestation (Merck and Company 1986). Pronghorn infected in the wild with EHD have been observed to have convulsions, "running fits," and ataxia (the inability to coordinate voluntary muscular movements); experimental infections additionally showed signs of anorexia, dyspnea (difficult or labored breathing), and central nervous system depression (Hoff and Trainer 1981). With both diseases, reproduction of wild ruminants may be adversely affected if does are infected during gestation, resulting in early absorption of the fetus, uncomplicated abortion, and higher susceptibility of fawns to infection, usually resulting in death. Additionally, does who have survived an infection "may succumb to the stress of pregnancy as a result of their earlier infection" (Hoff and Trainer 1981).

Blood samples from U.S. Sonoran pronghorns were collected between 1994 and 2000 for serologic, hematologic, and serum chemistry testing. Samples collected in 1994 provided evidence of pronghorn exposure to *Leptospira interrogans* serovar *hardjo* (a strain of the leptospirosis-causing bacteria carried by cattle and sheep) and a high seroprevalence (the rate at which a specific population tests positive for particular antibodies) to BTV and EHD, in both the 1994 and 1997 samples (National Wildlife Health Center, *in litt.* 1999). Results from the AGFD's winter 1997-1998 serology study showed a high seroprevalence for BTV and EHD. Of the nine serum samples, seven animals tested positive for BTV and all nine were positive for EHD; all were negative for leptospirosis (AGFD, *in litt.* 1998; University of Arizona, Arizona Veterinary Diagnostic Lab, *in litt.* 1998). Five additional samples were collected in December 2000 and evaluated at the Arizona Veterinary Diagnostic Lab at the University of Arizona. All five samples tested positive for both BTV and EHD (one sample was considered a "weak" positive) (Service 2001). Leptospirosis, BTV, and EHD may adversely affect reproduction and recruitment and are all potentially fatal diseases. Leptospirosis may be having an effect on

pronghorn reproduction and fawn survival by causing abortion or birth of fawns that are weakened by infection (National Wildlife Health Center, *in litt.* 1999).

D. Past and Ongoing Non-Federal Actions in the Action Area

The Status of the Species section describes a variety of human activities that have affected the Sonoran pronghorn since initiation of livestock grazing in the early 1700s (Officer 1993). Most non-Federal activities that have affected the pronghorn are historical in nature, and pronghorn have been all but extirpated from private, state, and Tribal lands.

Before the Taylor Grazing Act of 1934, and land use designations such as Organ Pipe Cactus NM, the BMGR, and Cabeza Prieta NWR, unregulated cattle grazing was widespread in the current range of the pronghorn. Forage and precipitation is greater in the eastern portion of the current range, thus it is likely that grazing was more prevalent in BMGR-East, Cabeza Prieta NWR and Organ Pipe Cactus NM, than in BMGR-West (MCAS-Yuma 2001). However, cattle grazing presently occurs west of Volcan Pinacate and near the Sierra del Rosario in northwestern Sonora, which are as dry as much of BMGR-West; thus we suspect cattle grazing historically occurred throughout the current U.S. range. The degree to which cattle grazing may have affected soils and vegetation communities in this area is impossible to quantify. Humphrey (1987) compared vegetation in historic photos taken at boundary monuments in the early 1890s with photos taken in the 1980s and could not discern any temporal differences in vegetation in what is now Organ Pipe Cactus NM, Cabeza Prieta NWR, and BMGR. However, the changes may have occurred before 1890. In reference to monument 172 at the southern end of the Quitobaquito Hills, Humphrey notes "the entire region near the spring has probably been grazed by domestic livestock since their introduction by the Spaniards in the early eighteenth century. Any grasses that might have grown there prior to that time had probably been grazed out long before the monument was erected." Organ Pipe Cactus NM (2001) discusses possible effects of long-term grazing in pronghorn habitat, and apparent evidence and impacts of grazing still visible at Organ Pipe Cactus NM 25 years after cattle were removed.

Before the establishment of Organ Pipe Cactus NM, BMGR, and Cabeza Prieta NWR, mining occurred in many of the mountain ranges of the area. The copper mine at Ajo was operated by Phelps Dodge Corporation and others from 1911 to 1985. The open pit mine and its tailings eliminated pronghorn habitat east and southeast of Ajo. Smaller mining operations caused habitat disturbance locally, but most mines were in mountainous terrain outside of pronghorn habitat.

Hunting and poaching may have been an important factor historically in the decline of pronghorn populations early in the 20th century; however, the Sonoran pronghorn has been protected from hunting in the U.S. for more than 50 years, and we are not aware of any recent poaching events (Service 1998a). Recreational hunting for other species occurs within the U.S. range of the pronghorn. Of particular importance is the bighorn sheep season, which occurs in December of each year, when a small number of hunters access remote portions of Cabeza Prieta NWR and

BMGR to hunt a limited number of sheep. Presence of hunters in pronghorn habitat and discharge of firearms has the potential to disturb pronghorn; however, sheep hunting occurs at a time of year when temperatures are moderate, and hunters focus their activities in the mountains whereas pronghorn are in the valleys and bajadas.

Development of agriculture, including construction of canals, roads, towns, a railroad, and other activities along the Gila River excluded pronghorn from the riparian habitats and water available along the river. Similarly, construction of Sonora Highway 2, the U.S./Mexico boundary fence, and towns and agriculture along the Rio Sonoyta, excluded pronghorn from these riparian habitats, as well. Flow in the Gila and Sonoyta rivers are now much reduced or restricted to return agricultural flows or periodic flood flows. These greenbelts may have been a source of water and forage, and probably acted as buffers, to enhance survival of pronghorn during drought periods (Service 1998a).

Numbers of undocumented migrants and smugglers have increased dramatically in the action area. Deportable migrant apprehensions by Border Patrol agents in the Ajo Station increased steadily from 9,150 in 1996 to 20,340 in 2000. A total of 25,074 pounds of marijuana were apprehended by Ajo Station agents in 2000 (U.S. Immigration and Naturalization Service 2001). In 2001, estimates of undocumented migrant traffic reached 1,000 per night in Organ Pipe Cactus NM alone (Organ Pipe Cactus NM 2001). These activities have resulted in route proliferation, off-highway vehicle (OHV) activity, increased human presence in backcountry areas, discarded trash, and abandoned vehicles. Habitat degradation and disturbance of pronghorn almost certainly results from these illegal activities. Increased illegal activities have precipitated increased law enforcement presence, particularly Border Patrol, with additional associated adverse effects. However, without Border Patrol efforts the impacts from undocumented migrants would be even greater.

E. Past and Ongoing Federal Actions in the Action Area

Because of the extent of Federal lands in the action area, most activities that currently, or have recently, affected pronghorn or their habitat are Federal actions. The primary Federal agencies involved in activities in the action area include the Marine Corps, USAF, Service, BLM, NPS, and Border Patrol.

Resource management on and near the BMGR is coordinated through the BEC, a group of Federal and state agency representatives with statutory authority and management responsibility for the BMGR, its resources, and adjacent Federal lands. Formalized in March 1998, the BEC provides a conduit for communication regarding resource management issues, conflicts, and planning on the BMGR. Membership on the council includes representatives from Luke AFB, MCAS-Yuma, the Phoenix and Yuma field offices of BLM, Cabeza Prieta NWR and Arizona ESO of the Service, Organ Pipe Cactus NM, AGFD, and Tucson and Yuma sectors of the Border Patrol. No single agency serves as the council lead and the organization operates on a consensus basis. One subcommittee of the BEC is dedicated to Sonoran pronghorn.

AGFD, working in cooperation with a number of federal agencies, has captured and radio-collared a total of 35 adult Sonoran pronghorn since 1994; 22 in 1994, nine in 1997/98, and four in 2000. Five pronghorn captured in 1994 died within 1-33 days post-capture. Three of these mortalities were from unknown causes, while two appeared predator-related (mountain lion and coyote). Since it is unusual to have this many animals die within 40 days post-capture, the direct or indirect effects of capture myopathy, was a suspected factor in their deaths. Capture and handling procedures were immediately modified and no subsequent losses related to capture myopathy have occurred. A sixth animal died from a broken neck caused by capture operations in December 2000. Despite these detrimental effects, data collected through radio telemetry are ultimately of great benefit to the conservation of the subspecies. Telemetry data provide information regarding habitat use and requirements, movement patterns, and increase the validity of population estimates.

In the following discussion, we have categorized Federal actions affecting the pronghorn as: (1) those actions that have not yet undergone section 7 consultation (although in some cases consultation has been completed on components of the Federal activity), and (2) Federal actions that have undergone consultation.

Federal Actions For Which Consultation Has Not Been Completed

Management at Cabeza Prieta NWR

Over 90 percent of Cabeza Prieta NWR was designated by Congress as wilderness in the 1990 Arizona Wilderness Act. To help maintain wilderness character, no vehicular traffic is allowed except on designated public use roads. Vehicles may be parked up to 50 feet from the center of the roads in areas previously used by other vehicles. All other off-road travel is prohibited. Visitors are encouraged to practice a "leave no trace" ethic. Recreational activities on the Cabeza Prieta NWR include backpacking, hunting, camping, rock climbing, mountain biking, and driving on roads. Before entering, visitors must obtain a valid Refuge Entry Permit and sign a Military Hold Harmless Agreement.

Most of the Cabeza Prieta NWR is within the air space of the BMGR. Numerous low-flying aircraft cross the Cabeza Prieta NWR on their way to air-to-ground bombing and gunnery ranges located to the north. Low-level helicopter flights are limited to flight corridors and occur only in the spring and the fall; in FY 1995 this use represented 4.5 and 16.5 hours, respectively. However, such flights may cause pronghorn to flee (Workman *et al.* 1992). Some military training exercises over the Cabeza Prieta NWR may require limitations on travel and even short periods of closure to the public.

Four-wheel drive vehicles are required on all routes except Charlie Bell Road where 2-wheel drive high-clearance vehicles may be driven. Driving in wet areas is prohibited and visitors are encouraged to not travel during wet conditions due to possible damage to refuge roads. In addition to the prohibitions mentioned above, the following activities are prohibited: dumping of

litter, sewage, or liquid waste; firearms, except as authorized in writing by the Cabeza Prieta NWR manager; prospecting, removal, or disturbance of sand, rock, gravel, or minerals; rock hounding; excavating or removing objects of antiquity, cultural artifacts, or paleontological artifacts; trapping; collecting, possessing, molesting, disturbing, injuring, destroying, removal, or transportation of any plant, or animal, or part of the natural flora and fauna on the NWR (exceptions to the above are legally taken game); wood campfires; and unleashed pets.

The management plan for the Cabeza Prieta NWR includes an endangered species management component (Service 1998b). Activities in this component include the use of remote sensors, an increase in monitoring, and the possibility of the establishment of experimental waters for pronghorn. Specific objectives concerning management goals for the pronghorn were presented in a preliminary draft Comprehensive Conservation Plan for the Cabeza Prieta NWR (Service 1998b) and included coordination with AGFD to conduct aerial surveys, weekly telemetry, flights, radio-collaring operations, digital vegetation mapping, food plot feasibility studies, installation of water developments with photomonitoring to document pronghorn use, telemetry tracking using remote data loggers, and coordination with Mexican authorities on pronghorn populations south of the border. When the Comprehensive Conservation Plan is completed, the Service will conduct section 7 consultation on that Plan. In the interim, the Service conducts section 7 consultation on individual actions when they are proposed.

Cabeza Prieta NWR provides habitat for the pronghorn and is actively working to conserve the species. However, the presence of humans within pronghorn habitat may constitute a major disturbance factor. Furthermore, human presence may restrict pronghorn access to cover and/or forage and effectively create a barrier to movement.

Tucson Sector of the Border Patrol

The Tucson Sector Border Patrol section 7 consultation is not yet complete (consultation number 2-21-99-I-138). This consultation encompasses all field activities conducted by the Border Patrol-Tucson Sector, as part of the program to detect, deter, and apprehend undocumented migrants and drug traffickers. The Tucson Sector is comprised of nine stations: Ajo, Casa Grande, Tucson, Nogales, Sonoita, Naco, Douglas, Wilcox, and Phoenix. The activities within 8 of these stations, Phoenix excluded, are addressed by the consultation. Activities within the Ajo Station have the greatest potential to adversely affect pronghorn. Adverse effects may result from patrol road activities, drag road activities, off-road operations, aircraft overflights, and the use and maintenance of sensors.

Patrol roads used by Border Patrol agents are typically public or private ranch roads. Although the Border Patrol is not the primary user of these roads, they do have the potential to encounter Sonoran pronghorn during patrols and cause them to flee the area. The Border Patrol monitors tracks of undocumented migrants on drag roads (dirt roads that are regularly cleared by dragging tires behind a vehicle and then monitored for human tracks). Less than 10 miles of drag roads are used by the Ajo Station. Pronghorn appear to have an affinity for drag roads as the process of

preparing the roads promotes forb growth (J. Hervert, pers. comm. 1999). Additionally, these roads may be utilized by pronghorn as bedding areas due to greater predator detection resulting from increased visibility (J. Hervert, pers. comm. 1999). Pronghorn attracted to these areas may be adversely affected by the presence of patrols and road preparation activities. Sensors are placed at strategic locations along the U.S.-Mexico border on established roads or trails within known travel corridors to detect illegal activities. The Ajo Station uses and maintains approximately 85-90 sensors during daily operations. Sensor installation and/or maintenance activities could disturb pronghorn if they are in the immediate area. However, these disturbances should be infrequent and short in duration.

Off-road activities include agents on foot, the use of OHVs, including four-wheel drive vehicles, dirt bikes, and all-terrain vehicles. These activities may disturb pronghorn and disrupt normal behavioral activities. Motorized off-road activities also degrades pronghorn habitat. In addition to off-road activities, one routine helicopter patrol route is flown from Why along a southwesterly route to the Agua Dulce Mountains. Additional helicopter activities may occur throughout the range of the pronghorn and helicopters may hover and land. Areas where low-level helicopters are used have the highest potential for disturbance to pronghorn. Evidence from other subspecies of pronghorn and other ungulates suggests that pronghorn may exhibit elevated heart rates, may flee, and could alter habitat use in response to low-level helicopter flights (Workman *et al.* 1992).

Yuma Sector Border Patrol Beacon Stations

Recently, the Border Patrol has proposed the installation of at least six emergency beacon stations (panic buttons) on the BMGR. The stations will be comprised of a 30-foot pole illuminated with a beacon. The poles are mounted on a cement block that is approximately 5 ft² and 3 to 4 ft high. While the installation of the stations will result in little habitat disturbance, the presence of the electronic stations will increase human presence in these areas (undocumented migrants, and maintenance and rescue crews) and therefore represents an additional disturbance factor for pronghorns. The Border Patrol has initiated emergency consultation on this project as a means to reduce mortality of illegal migrants.

Federal Actions Addressed in Section 7 Consultations

As part of our comprehensive discussion of all past and present actions affecting pronghorn within the action area, we describe below all biological opinions issued to date that may affect the pronghorn.

Four of the opinions addressed projects with minor effects to the pronghorn. Two opinions (consultation numbers 2-21-83-F-26 and 2-21-88-F-6) covered capture and collaring of pronghorn for research purposes, with no take of pronghorn anticipated. Consultation number 2-21-88-F-81 involved installation of a water source in the Mohawk Valley for pronghorn, with no take anticipated. Consultation number 2-21-89-F-8 addressed change in aircraft use by Luke

AFB on the BMGR, including change in aircraft type from the F-15A/B to the F-15E, and an increase in nocturnal flights (F-15E Beddown Project). The Service anticipated take of pronghorn in the form of harassment as a result of aircraft overflights. Reasonable and prudent measures to minimize take included: (1) development of long-term studies to determine the effects of overflights on the pronghorn, (2) if effects of overflights are identified, Luke AFB would work with the Service to eliminate them, and (3) work involving pronghorn would be carried out in accordance with appropriate State and Federal permits. This project was later incorporated into the biological opinion on Luke AFB's activities on the BMGR, discussed below.

BLM's Lower Gila South Management Area

Three biological opinions address BLM's Lower Gila South Management Area. The Lower Gila South Resource Management Plan-Goldwater Amendment (consultation number 2-21-90-F-042), proposed specific and general management guidance for non-military activities on the BMGR. Of particular importance for pronghorn was proposed management of recreation. Use of the BMGR is by permit only. The number of BMGR recreational use permits issued by the BLM field offices has increased dramatically in recent years, with a total of 893, 2545, and 3528 permits issued in 1998, 1999, and 2000, respectively. Permits are also issued by the USAF, Marine Corps, and Cabeza Prieta NWR. Permits are valid for any part of the BMGR that is open to public recreation. Recreation authorized on the BMGR included sightseeing, OHVs, vehicle camping, backpacking, hiking, and picnicking. The presence of an increasing number of humans creates a disturbance risk to pronghorns, and OHVs may constitute a mortality factor. The OHV roads and heavily used vehicle-camping areas degrade habitat and may disturb pronghorn, as well as create barriers to pronghorn movement. No incidental take was anticipated. The Service provided conservation recommendations to reduce interaction between pronghorn and recreationists, exclude wild horses and burros from endangered species habitat, and investigate the effects of water sources on pronghorn. The non-jeopardy biological opinion, issued April 25, 1990, was programmatic, requiring BLM to consult when site-specific projects are proposed. To date, no site-specific formal consultations have been conducted. In November 2001, BLM's management of the range will cease and will be replaced by an Integrated Natural Resources Management Plan, currently in preparation by MCAS-Yuma and Luke AFB.

The Lower Gila South Habitat Management Plan (HMP) (consultation number 2-21-89-F-213) provided management guidance for both specific and general actions in southwestern Arizona. Four actions were addressed in the HMP, including an exchange of 640 acres near Ajo, rehabilitation work on two catchments, and assessment of livestock removal from pronghorn habitat. Exchange of land out of public ownership may facilitate development or other uses that would preclude use by pronghorn. The Service provided the following conservation recommendations: a study to determine the effects of water developments on pronghorn and their competitors and predators, and development of a water catchment renovation plan in coordination with Cabeza Prieta NWR. No incidental take was anticipated. The non-jeopardy opinion was issued on May 15, 1990.

The biological opinion for the Lower Gila South Resource Management Plan and Amendment (consultation number 2-21-85-F-069) addressed programmatic management of lands in southwestern Arizona, including livestock grazing, wilderness, cultural resources, fire, minerals and energy, recreation, wildlife management, wood cutting, Areas of Critical Environmental Concern, and other land uses. The biological opinion concluded that OHV restrictions and designations of Areas of Critical Environmental Concern would benefit pronghorn, but wood cutting, recreation, grazing activities, mining, and designation of utility corridors would adversely affect pronghorn. Incidental take of the pronghorn was anticipated, but not quantified. Any decline of forage quality or increase in the amount of fencing was judged to indicate that incidental take had been exceeded. Reasonable and prudent measures and terms and conditions to minimize take included: (1) modifying grazing allotment fences to allow passage of pronghorn, (2) improving habitat conditions for the pronghorn, and (3) minimizing human disturbance. The Service provided conservation recommendations to monitor pronghorn use of the area, assess pronghorn use at livestock waters, and consolidate lands through land exchanges. The non-jeopardy biological opinion was issued on March 27, 1998. In accordance with the opinion, BLM has monitored livestock grazing and allotment fences have been modified to allow passage of pronghorn. Enforcement of vehicle and camping regulations has been increased south of Ajo.

In summary, the biological opinions for BLM's Lower Gila South Planning Area anticipated adverse effects to pronghorn and their habitat from livestock grazing, recreation, a land exchange, wood cutting, mining, and designation of utility corridors, resulting in an anticipated unspecified amount of take. The Service determined that the proposed actions were not likely to jeopardize the continued existence of the pronghorn.

BLM grazing allotments in the vicinity of Ajo, Arizona

The biological opinion (consultation number 2-21-94-F-192), issued December 3, 1997, addressed effects to pronghorn resulting from issuance of grazing permits on five allotments, four of which are located near Ajo and Why (Cameron, Childs, Coyote Flat, and Why allotments); and the fifth near Sentinel (Sentinel allotment). All but the Child's allotment were considered to be within the current distribution of the Sonoran pronghorn. According to the BLM, livestock use of the five allotments had been relatively low in the previous ten years. The effects of stocking the allotments at any level had not been analyzed. Monitoring of the Coyote Flat and Why allotments had not occurred. The BLM permittees have not fully stocked the Cameron, Why, Sentinel, and Childs allotments for a sustained period of time. The Coyote Flat Allotment has been billed for full stocking. According to the BLM, monitoring data had not shown overutilization of the vegetation or a change in vegetation composition. The BLM estimated that if allotments were stocked at permitted levels, forage utilization rates could approach 40 percent. Preliminary data from the BLM and the AGFD showed that there is little dietary overlap between pronghorn and cattle. Because of this, the amount of forage on allotments, and the likely utilization levels, we found that adequate forage for the pronghorn should be available. Maintenance of livestock waters, fences, and other improvements may

temporarily disrupt pronghorn activity. Pronghorn may also become entangled in livestock fences.

The Service determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. Incidental take of one pronghorn was anticipated to occur in the form of harassment or death due to grazing management activities during the 15 year proposed action. The following reasonable and prudent measures were provided to minimize take of pronghorn: (1) minimize impacts to pronghorn from grazing and (2) minimize habitat loss, degradation, and fragmentation of pronghorn habitat. The opinion included the following conservation recommendations: develop allotment management plans for each allotment and monitor pronghorn use within Cameron, Coyote Flat, Sentinel, and Why allotments.

The BLM has provided two reports regarding the implementation of reasonable and prudent measures. The 1998-1999 report (dated April 13, 2000) stated that no maintenance work was authorized within the "area covered by this opinion". BLM established "utilization studies" on the Sentinel, Coyote Flat, and Why allotments in November 1998. The studies appear to consist of one transect for each of the allotments. The utilization transects for the Sentinel, Coyote Flat, Why, and Cameron allotments were read in 1998 and 1999. BLM reported low level of utilization within the study areas. The 2000 report (dated November 28, 2000) stated that BLM modified 18 miles of fence within the allotments (three fencelines between Cameron, Why, and Coyote Flat and a small fence area within Coyote Flat) by replacing the bottom strand with smooth wire, raised 18 inches above ground level. The work was conducted June through August of 2000. Utilization transects for the four allotments were read in 2000. Again, BLM reports low levels of utilization. Both reports state that there had been no incidental take of pronghorn as of the date of each report.

Marine Corps Air Station-Yuma in the Arizona Portion of the Yuma Training Range Complex

This biological opinion (consultation number 2-21-95-F-114), issued on April 17, 1996, addressed all proposed and authorized actions on the BMGR by MCAS-Yuma, including proposed changes to military flights over Cabeza Prieta NWR, ongoing flights over BMGR, and operation of various training facilities such as landing strips, a rifle range, targets, a parachute drop zone, a transmitter/telemetry system, and ground support areas. MCAS-Yuma conducts Weapons Tactics Instructors (WTI) courses twice a year (March-April and October-November). During a typical WTI course, one flight/day of two to eight helicopters traverse Cabeza Prieta NWR and the BMGR within established flight corridors from west to east. Helicopters use the corridors for 5-17 days. Additional low-level fixed-wing aircraft corridors over Cabeza Prieta NWR are used for six days per course.

Ground-based activities, such as those of troops and vehicles at ground-support areas were likely to adversely affect pronghorn habitat use. Over the entire project area, ground-support areas in potentially occupied pronghorn habitat would encompass approximately 32.4 mi². Numerous pronghorn have been located in recent years in R-2301W on the BMGR and the Cabeza Prieta

NWR east of the Baker Peaks, Copper, and Cabeza Prieta mountains. In this area, ongoing and proposed military ground-based activities have the greatest potential for adversely affecting pronghorn. Military overflights do not cause habitat degradation, but pronghorn may respond with increased heart rates and flee from aircraft, particularly low-level helicopters. The increased energy expenditure associated with flight behavior may lead to lower reproductive output and/or survival. Additionally, pronghorn may avoid flight paths, which may result in an indirect loss of useable habitat. In areas where helicopters fly particularly low and create more noise and greater visual stimuli, disturbance to pronghorn would be expected to be greater. Ordnance delivery may also adversely affect pronghorn on the area. Pronghorn use both the North and South TACs, and ordnance, live fire, and shrapnel could potentially strike and kill or injure a pronghorn. Furthermore, pronghorn could be killed or injured during an encounter with unexploded live ordnance on the ground. MCAS-Yuma proposed measures to minimize, in part, the direct and indirect impacts of the proposed action, including measures to reduce or eliminate take of, Sonoran pronghorn and to minimize destruction and degradation of habitat.

The Service determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. Incidental take of one pronghorn per 10 years was anticipated in the form of direct mortality, and undetermined numbers of pronghorn were anticipated to be taken in the form of harassment by low-level fixed wing and helicopter flights, military vehicles, or other activities authorized, funded, or carried out by MCAS-Yuma. The following reasonable and prudent measures were provided to minimize take of pronghorn: (1) personnel and visitors educational/information programs and operational procedures, (2) to the extent practicable, military activities shall be located outside of pronghorn habitat, and (3) monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring. The following conservation recommendations were provided: (1) continue to fund and support basic research, inventory, and monitoring of the pronghorn. In particular, MCAS-Yuma should investigate the effects of low-level helicopter and fixed wing aircraft flights over the BMGR and Cabeza Prieta NWR and ground based military activities on the behavior and physiology of the pronghorn; and (2) map noise level contours resulting from military flights over the Cabeza Prieta NWR. This map should be provided to Cabeza Prieta NWR for analysis of the effects of aircraft noise on pronghorn habitat use.

Implementation of MCAS's proposed mitigation (minimization) measures, the reasonable and prudent measures, and terms and conditions is unclear because of inadequate reporting by MCAS. The Service has only received annual reports for 1998 and a draft report for 1999. With few exceptions, these reports have not detailed, action by action, what steps MCAS-Yuma has taken to implement the opinion. In 1999, MCAS reported that no pronghorn habitat was modified, Range Management received no reports of Sonoran pronghorn encounters, and all air and ground crews were briefed on the requirements of the opinion. The Service is not aware of any incidental take of pronghorn attributable to MCAS-Yuma YTRC activities. On March 18, 1998, an amendment was requested on the consultation by MCAS-Yuma. This request slightly changed the description of the equipment and personnel to be used in the Stoval Field exercise

area. The Service determined that the changes would have no additional effects not already anticipated in the biological opinion.

Organ Pipe Cactus NM General Management Plan

The biological opinion (consultation number 2-21-89-F-078), issued June 26, 1997, addressed implementation of Organ Pipe Cactus NM's General Management Plan. The purpose of the Management Plan is to guide management for the next 10-15 years. Plan elements included: (1) working with Arizona Department of Transportation to ensure continued travel and commerce on SR 85 while enhancing resource protection, (2) seeking designation of Organ Pipe Cactus NM as the Sonoran Desert National Park, (3) establishment of partnerships to share facilities, staff, and costs in Why and Lukeville, (4) increased wilderness and development of an interagency wilderness and backcountry management plan, (5) changes in trails at Quitobaquito, (6) changes in facilities in the Twin Peaks area, (7) increasing primitive camping and designated trails, and (8) full implementation of the Organ Pipe Cactus NM Cultural Resources Management Plan.

To reduce adverse effects on pronghorn, Organ Pipe Cactus NM proposed the following: (1) pursue an agreement with Arizona Department of Transportation to establish a vehicle for continued communication regarding road-related issues, construct underpasses at known movement corridors to facilitate safe passage of pronghorn across the highway, and establish a program to explore other measures to better understand and subsequently reduce the impacts of SR 85 on pronghorn; (2) continue working with the Arizona Department of Public Safety to enforce the existing speed limit within Organ Pipe Cactus NM; (3) convert the bottom strands of Organ Pipe Cactus NM's north and south boundary fences to smooth wire to encourage pronghorn movements between Organ Pipe Cactus NM and surrounding areas; (4) educate motorists about the plight of pronghorn using a variety of interpretive media in an effort to encourage lower speeds and increased awareness of wildlife use of the highway corridor; (5) continue to serve as a member of the Interagency Core Working Group for Sonoran pronghorn recovery and implement activities outlined in the recovery plan, including development of a monitoring program; and (6) monitor visitor use and restrict access where necessary to minimize the potential for disturbance to pronghorn.

Recreational activities include hiking, camping, horse-back riding, and biking. These activities can disturb pronghorn and degrade habitat. Maintaining and/or adding hiking trails at Organ Pipe Cactus NM is likely to maintain or increase visitor presence in pronghorn habitat, resulting in long-term, moderate, adverse, regional disturbance to pronghorns. All proposed facilities would be located within areas of existing development and would involve relatively small tracts of land surrounded by larger areas of undisturbed habitat. However, development of facilities that result in increased visitor use may adversely affect the pronghorn. Increased use of some frontcountry and backcountry areas has the potential to adversely affect pronghorn if it causes an alteration in behavior or habitat use. Increased visitation to Organ Pipe Cactus NM was also expected to result in increased traffic along SR 85, adding to the barrier effect of existing traffic patterns. Approximately 22 miles of SR 85 lie within Organ Pipe Cactus NM. The Service

concluded that the highway is a deterrent to expanding pronghorn populations, and resulting modified behavioral patterns may lead to a reduction in genetic exchange, reduced viability, and a concomitant reduction in the ability of pronghorn to adapt to environmental change.

The Service determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. Incidental take in the form of injury or death to one pronghorn associated with traffic on SR 85 was anticipated. The following reasonable and prudent measures were provided to minimize take of pronghorn: (1) work with agencies to implement actions to reduce effects of current and future traffic patterns on SR 85; (2) fences shall be modified for pronghorns; (3) motorists shall be educated on pronghorn vulnerability to traffic; and (4) monitor use and restrict access where necessary to minimize pronghorn disturbance. The following conservation recommendation was provided: the NPS should continue to contribute to multi-agency recovery efforts and help implement appropriate management actions as new information becomes available.

It is unclear to what extent Organ Pipe Cactus NM has begun to reduce the impacts of traffic speed and volume along SR 85. Organ Pipe Cactus NM cites "installation of new road signs" and construction of "interpretive waysides" as part of the "completed or continuing" projects of the General Management Plan (Organ Pipe Cactus NM 2001). According to Organ Pipe Cactus NM personnel, these projects are in the planning stages (T. Tibbitts, Organ Pipe Cactus NM, pers. comm. 2001). Organ Pipe Cactus NM has remained a member of the Recovery Team, and has continued to aid in implementation of recovery plan activities, including population monitoring and radiotelemetry studies. The livestock fence on the boundary between Organ Pipe Cactus NM and Cabeza Prieta NWR has been removed. The livestock fence along Organ Pipe Cactus NM's northern boundary with BLM lands west of SR 85 has been modified for pronghorn. It is unclear what, if anything, Organ Pipe Cactus NM has done to reduce the impacts of SR 85 through public education. Organ Pipe Cactus NM has closed the Pozo Nuevo Road seasonally, partly in response to pronghorn use. However, they used concrete Jersey barriers to block the road which resulted in habitat destruction as illegal traffic expanded out into the desert to go around the barrier. Organ Pipe Cactus NM law enforcement has been working with Border Patrol to address illegal traffic, and has incorporated pronghorn radiotelemetry data into their management of park traffic with some degree of success (T. Tibbitts, pers. comm. 2001). No incidental take of pronghorn associated with the proposed action has been documented.

Luke AFB Use of Ground-Surface and Airspace for Military Training on the BMGR

The biological opinion (consultation number 2-21-96-F-094), issued August 27, 1997, addressed military use of airspace and ground space on the eastern half of the BMGR by Luke AFB. At the time of the consultation, about two-thirds of the BMGR was located on lands managed primarily by the BLM, with the remaining third located within Cabeza Prieta NWR. Approximately 5 percent (7.6 percent, not including Cabeza Prieta NWR) of the range had been impacted by military activities. Military activities within the area of overlap with the Cabeza Prieta NWR

were limited to use of airspace and operation of four Air Combat Maneuvering Instrumentation sites. The eastern part of the BMGR is known as the Gila Bend segment. Military activities occurring within the Gila Bend segment are managed by Luke AFB and included: airspace use, four manned air-to-ground ranges, three tactical air-to-ground target areas, four auxiliary airfields, Stoval Airfield, and explosive ordnance disposal/burn areas.

The Service determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. During each 10-year period of the project, take was anticipated in the form of harassment that is likely to injure up to two pronghorn and in the form of death of at least one pronghorn. The following reasonable and prudent measures were provided to minimize take: (1) minimize impacts of activities on pronghorn; (2) minimize habitat loss, degradation, and fragmentation of pronghorn habitat; (3) monitor and study reactions of pronghorn on the BMGR to military activities; and (4) determine the level of incidental take that results from the project. The following conservation recommendations were provided: (1) Luke AFB should pursue funding for all research needs that are identified for implementation by DoD in the final revision of the pronghorn recovery plan, as well as all research needs that are now and in the future identified by the Sonoran Pronghorn Core Working Group; (2) Luke AFB should conduct and/or fund research to determine the effects of low level flights on free-ranging pronghorn and use the information to evaluate flight ceilings and flight corridors (i.e., Military Training Routes) over Cabeza Prieta NWR; and (3) Luke AFB should fund and implement an ecosystem partnership for managing the Sonoran Desert to determine other conservation needs in the area.

Implementation of the reasonable and prudent measures have been documented in their annual reports for which the Service is in receipt of the 1998, 1999, and 2000 reports. The Service is not aware of any take of pronghorn attributed to Luke AFB use of the ground-surface and airspace on the BMGR, although a pronghorn found dead near a target may have been strafed, it is also possible that it died from other causes.

Border Patrol Activities in the Yuma Sector, Wellton Station, Yuma, Arizona

This biological opinion (consultation number 2-21-96-F-334), issued September 5, 2000, addressed all Border Patrol activities along the United States/Mexico border in Yuma County from the Colorado River to about the area of Pinta Sands at the south end of the Sierra Pinta Mountains. Border Patrol activities within the Yuma Sector/Wellton Station included helicopter and ground patrols; drag road preparation and assessment of road maintenance; remote sensor installation and maintenance; apprehensions and rescues; and assistance to other sectors and agencies. To reduce adverse effects on pronghorn, the Border Patrol agreed to implement the following measures: (1) purchase new, quieter MD600N helicopters to replace existing OH-06As; (2) contact the AGFD weekly for an update on weekend telemetry flights to avoid areas of pronghorn concentration; (3) modify helicopter flights to avoid fawning areas during the three peak months of the fawning season (April-June); (4) make confidential monthly reports to the manager of Cabeza Prieta NWR detailing the law enforcement actions and wildlife observations made during the previous month; (5) finalize the Memorandum of Understanding between the

Border Patrol and Cabeza Prieta NWR to address objectives that will minimize potential conflicts including limiting of routine patrols and off-road use in wilderness and provide a framework for cooperation; and (6) conduct an annual interagency meeting with Cabeza Prieta NWR, the Arizona ESO, and BLM to present the annual report and discuss ways to improve coordination.

Disturbance to pronghorn was anticipated as a result of on-the-ground Border Patrol operations, and direct injury or mortality of pronghorn as a result of collision with Border Patrol vehicles or by low level helicopter flights abruptly approaching and startling pronghorn which may result in injury or energetic stress, particularly during drought. Pronghorn may also be adversely affected by noise and visual impacts of aircraft overflights. The increased energy expenditure caused by sudden or loud noises may lead to lower reproductive output and/or survival. The potential for detrimental effects to pronghorn may be greatest during the fawning season (April-June). Habitat disturbance due to off-road vehicle travel would also result.

The Service determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. The Service anticipated take in the form of harassment that is likely to injure up to one pronghorn in 10 years. The following reasonable and prudent measures were provided: (1) minimize injury of pronghorn; (2) monitor and study reactions of pronghorn on BMGR to Border Patrol activities; and (3) provide a means to determine the level of incidental take that results from Border Patrol activities. The following conservation recommendations were provided: (1) assign an environmental protection specialist to coordinate the effects of their activities statewide on listed species in order to reduce these impacts where possible; (2) continue participation in ecosystem partnerships with other Federal agencies in pronghorn habitat; and (3) obliterate and block illegal roads in pronghorn habitat created by illegal border traffic.

The Border Patrol has not submitted an annual report of their activities, therefore, the Service has no information on implementation of the reasonable and prudent measures, terms and conditions, conservation recommendations, or conservation measures that were part of the proposed action. Additionally, the Service has been informed by Luke AFB representatives that the Border Patrol has graded additional drag roads in San Cristobal Valley. The Service is not aware of any incidental take attributable to Border Patrol activities in the Yuma Sector's Wellton Station resulting from the proposed action.

Western Army National Guard Aviation Training Site Expansion Project

The non-jeopardy biological opinion for the Western Army National Guard Aviation Training Site (WAATS) (consultation number 2-21-92-F-227) was issued on September 19, 1997. The purpose of WAATS is to provide a highly specialized environment to train ARNG personnel in directed individual aviator qualification training in attack helicopters. The WAATS expansion project includes: (1) expansion of the existing Tactical Flight Training Area which includes establishing four Level III touchdown sites, (2) development of the Master Construction Plan at

the Silver Bell Army Heliport, and (3) establishment of a helicopter aerial gunnery range for use by the ARNG on the existing East TAC on the BMGR.

This biological opinion did not address the pronghorn, but, in the Court's opinion, should have and was therefore remanded by the Court. Per the final EIS for WAATS, ARNG use of East TAC did not cause existing training to shift to North or South TACs because the USAF eliminated F-15E training at BMGR, concentrating on F-16 air-to-air and air-to-ground training. This opened up opportunity to absorb the WAATS air-to-ground training on East TAC which is located closer to Gila Bend AFAF and Silver Bell Army Heliport. Therefore, the EIS did not consider impacts to the pronghorn and none were anticipated. All activities that are part of the proposed action occur outside the current range of the pronghorn, with the exception of training at North TAC. Training at East TAC could preclude recovery of historic habitat if the many other barriers that prevent pronghorn use of East TAC were removed. Training at North TAC only occurs when East TAC is closed for annual maintenance and EOD clearances. Effects to pronghorn at North TAC are minimized by monitoring protocols established by Luke AFB.

F. Summary of Activities Affecting Sonoran Pronghorn in the Action Area

Historically, livestock grazing, hunting or poaching, and development along the Gila River and Rio Sonoyta were all probably important factors in the well-documented Sonoran pronghorn range reduction and apparent population decline that occurred early in the 20th century. Historical accounts and population estimates suggest pronghorn were never abundant in the 20th century, but recently, the estimated size of the population in the action area declined from 179 (1992) to 99 (2001). At 99 animals, maintenance of genetic diversity is questionable, and the population is in danger of extirpation due to human-caused impacts, or natural processes, such as drought or predation. The reason for the decline is not clear, but a combination of factors are likely responsible. The U.S. pronghorn population is isolated from other populations in Sonora by a highway and the U.S./Mexico boundary fence, and access to the greenbelts of the Gila River and Rio Sonoyta, which likely were important sources of water and forage during drought periods, has been severed.

Within its remaining range, the pronghorn is subjected to a variety of human activities that disturb the pronghorn and its habitat, including military training, increasing recreational activities, grazing, increasing presence of undocumented migrants and smuggling, and in response, increased law enforcement activities. MCAS-Yuma (2001) quantified the extent of the current pronghorn range that is affected by various activities and found the following: recreation covers 69.6 percent of the range, military training on North and South TACs covers 9.8 percent, active air-to-air firing range covers 5.8 percent, proposed EOD five-year clearance areas at North and South TACs and Manned Range 1 cover 1.0 percent, and MCAS-Yuma proposed ground support areas and zones cover 0.29 percent. In addition, livestock grazing occurs over 5.6 percent of the pronghorn's current range (Organ Pipe Cactus NM 2001, Bright *et al.* 2001); a total of 860 miles of roads occur in the current range (MCAS-Yuma 2001), and foot and vehicle traffic by undocumented migrants and smugglers occurs at an increasing frequency throughout

the area. Organ Pipe Cactus NM (2001) identified 165 human activities in the range of the pronghorn, of which 112 were adverse, 27 were beneficial, 26 had both adverse and beneficial effects, and 4 had unknown effects. Organ Pipe Cactus NM (2001) concluded that in regard to the pronghorn, "while many projects have negligible impacts on their own, the sheer number of these actions is likely to have major adverse impacts in aggregate."

The current range of the pronghorn in the U.S. is almost entirely comprised of lands under Federal jurisdiction; thus activities that currently affect the pronghorn in the action area are almost all Federal actions. In seven of 12 biological opinions issued by the Service that analyzed impacts to the pronghorn, the Service anticipated that take would occur. In total, the Service anticipated take of five pronghorn in the form of direct mortality every 10-15 years, and an undetermined amount of take in the form of harassment. The Service is unaware of any take resulting from these actions to date. Given the small and declining population of pronghorn in the U.S., take at the levels anticipated in the biological opinions would constitute a substantial impact to the population.

Changes in the remanded biological opinions have reduced the amount or extent of incidental take anticipated to occur from Federal actions. In total, the Service anticipates take in 5 of the 13 (the original 12 opinions plus the ARNG opinion that now considers effects on the pronghorn) biological opinions issued for the Sonoran pronghorn. This amount of take is less than that anticipated in the original opinions because the Service and the Federal agencies have worked together to minimize the effects of ongoing and proposed activities on the Sonoran pronghorn.

We believe the aggregate effects of limitations or barriers to movement of pronghorn and continuing stressors, including habitat degradation and disturbance within the pronghorn's current range resulting from a myriad of human activities, combined with periodic dry seasons or years, are responsible for the present precarious status of the Sonoran pronghorn in the U.S.

IV. EFFECTS OF THE PROPOSED ACTION

Adverse and beneficial effects of the action on the pronghorn will result from: (1) livestock grazing that results in habitat degradation and loss/restriction of forage and restricts pronghorn movements and potential range expansion, (2) disease transmission from livestock to pronghorn, (3) construction and maintenance of range improvements (e.g., the construction of New Well) that destroys and/or degrades foraging habitat, and (4) the proposed conservation measures.

Livestock Grazing

The effects of grazing on Sonoran Desert scrub communities have not been well-studied. Grazing can result in reduced shrub cover (Webb and Stielstra 1979) and desirable shrubs (Orodho *et al.* 1990) in Mojave Desert scrub and Great Basin Desert scrub, respectively. In general, grazing practices can change vegetation composition and abundance, and cause soil erosion and compaction, reduced water infiltration rates, and increased runoff (Klemmedson

1956, Ellison 1960, Arndt 1966, Gifford and Hawkins 1978, Robinson and Bolen 1989, Waser and Price 1981, Holechek *et al.* 1998, and Loftin *et al.* 2000), leaving less water available for plant production (Dadkash and Gifford 1980).

Changes to the structure and composition of xero-riparian and Sonoran Desert scrub communities can result in increased susceptibility of pronghorn fawns to predators, loss or reduction of suitable thermal cover, and habitat fragmentation. Year-long grazing in Sonoran Desert scrub habitat can, in the long-term, decrease potential cover for fawns (Robinson and Bolen 1989) and reduce thermal cover by suppressing regeneration of trees in xero-riparian areas and by inhibiting growth of sufficient understory and ground cover.

Cryptobiotic crusts, consisting of lichens, fungi, algae, mosses, and cyanobacteria are important soil stabilizers of desert soils (Kleiner and Harper 1972, 1977; Belnap 1992). These crusts decrease wind erosion (Brady 1974 in Anderson *et al.* 1982) and have a significant effect on soil stability and rates of water infiltration (Kleiner and Harper 1972, 1977; Belnap 1992; Belnap and Gardner 1993). These crusts also act to increase the availability of many nutrients in sandy soils (Belnap 1992; Belnap and Gardner 1993). Grazing caused considerable damage to cryptobiotic crusts, resulting in less stable soil conditions at Navajo National Monument, Arizona (Brotherson *et al.* 1983). Trampling can reduce soil stability, soil fertility, and soil moisture retention (Belnap 1992). In cool deserts, the lichen component takes 40 years or more to fully recover (Johansen *et al.* 1991). Cryptobiotic crusts will not likely recover significantly from previous disturbances under a year-long, or even seasonal, grazing regime. Without these crusts, the reestablishment of the potential natural community may not occur (Menke 1988).

The intensity of damage to cryptobiotic crusts and vegetation caused solely by cattle is assumed to be directly proportional to the AUMs of forage used per pasture (BLM 1980). The most severe impacts occur in areas used for loading and unloading cattle, supplemental feeding, watering sites, and salt licks. In these areas, effects to habitat, such as vegetation removal, soil compaction (Orodho *et al.* 1990) and resultant reduction in soil moisture (Daddy *et al.* 1988), and presumably crushing of small cacti, are most prevalent.

Disturbance of soils, including cryptobiotic crusts, and removal of vegetation by grazing combine to increase surface runoff and sediment transport, and decrease infiltration of precipitation (Gifford and Hawkins 1978, Busby and Gifford 1981, Blackburn 1984, DeBano and Schmidt 1989, Belnap 1992, Belsky and Blumenthal 1997). Loss of vegetation cover and trampling of soils promote further deterioration of soil structure, which in turn accelerates vegetation loss (Belsky and Blumenthal 1997). Vegetation loss reduces the amount of thermal and protective cover available for fawns and adults. Rutman (1996) (Appendix 2) describes such conditions within the Cuerda de Lena on BLM land. Furthermore, erosion decreases the ability of the habitat to recover due to loss of nutrients and the seed bank usually present in the topsoil.

Holechek (1988) and Holechek *et al.* (1998) found that, in desert scrub, average utilization rates of 25-35 percent are appropriate for maintaining range condition. Within that range, several

factors determine whether a low, medium, or high value should be selected. Holechek *et al.* (1998) suggest that on ranges in good condition with relatively flat terrain and good water distribution, the higher utilization limit may be appropriate. If the range is in poor or fair condition, or the allotment has thin soils, rough topography, and poor water distribution, the lower utilization rate may be appropriate.

Waser and Price (1981) found that in the Sonoran Desert of southern Arizona, "species diversity declines consistently as a function of increasingly recent grazing by cattle." Furthermore, as the vegetation community continues to regress with persistent overgrazing, degradation of the soil/water relationship occurs resulting in a reduction of the carrying capacity for grazing animals even after stocking rates are decreased (Robinson and Bolen 1989). Although grazing has been removed from the Federal lands adjacent to the Ajo allotments west of SR 85 for 15 to 22 years, full recovery of the desert plant communities will likely take a long period of time, potentially many more decades or even centuries (Organ Pipe Cactus NM 2001), without intensive recovery management (Robinson and Bolen 1989).

Waser and Price (1981) found that immediately after the removal of cattle, the increased appearance of species with fairly low abundance may occur rapidly if dormant seeds remain in the soil from production occurring prior to the introduction of cattle and/or reinvasion of the area from ungrazed areas occurs. However, the authors go on to state that at their study sites at the northern boundary of Organ Pipe Cactus NM, most of the dormant seeds are not likely to be viable as grazing was introduced to the area in the early 1900s and they presume that dispersal rate is low, keeping the abundance of under-represented species low for some time. Rutman (1996) reports that aerial photographs taken in 1987, 10 years after the discontinuation of grazing on Organ Pipe Cactus NM, show a contrast in vegetation between ungrazed Organ Pipe Cactus NM land and grazed BLM land, with greater density and higher cover on Organ Pipe Cactus NM. Photographs taken by Rutman in 1995 (Appendix 2) show a contrast in vegetation structure and density and bank stability between grazed and currently ungrazed portions of the Cuerda de Lena Wash. Although full recovery of the range from severe overgrazing will take much longer, clearly measurable recovery can occur over shorter timeframes.

A portion of a satellite imagery poster published by J.C. Dohrenwend, sold retail at the Organ Pipe Cactus NM. and reproduced with Mr. Dohrenwend's permission (J. Dohrenwend pers. comm. 2001), is shown in Figure 4. In the image, the boundary of BLM Ajo allotments and their southern and western boundaries with Organ Pipe Cactus NM and Cabeza Prieta NWR, respectively, are clearly visible. Dr. Stewart Marsh, a professor at the Arizona Remote Sensing Center, University of Arizona, and an expert in the field of remote sensing and interpretation of satellite imagery, was contacted by the Service to provide input on the tonal difference seen in the image. After examining the image, Dr. Marsh informed us that these types of tonal differences, or differences in contrast, are most likely due to differences in vegetation amount or type. In the cases Dr. Marsh is familiar with, including satellite imagery of the U.S./Mexico border and the National Audubon Society Appelton-Whittle Research Ranch near Elgin, Arizona, tonal variations in the image were correlated with differences in the amount or type of

vegetation due to differences in land use. The amount of contrast is usually greatest at times of “green-up” such as after a rainy period, when ephemeral growth is greatest. In all of the cases Dr. Marsh is familiar with, the land use difference was the intensity of grazing, with greater grazing intensity on the lighter side of the image. The type of contrast seen in Figure 4 can also be seen in a landsat image of the Why, Arizona, area. That image, taken October 10, 1999, is available on the University of Arizona ARIA website (<http://aria.arizona.edu>, path 37, row 38, TM sensor, bands 1-8). The contrast between BLM and adjacent land is most consistent with a fence line boundary where different types of land use are occurring, and more specifically where greater grazing intensity correlates with less vegetation or a difference in vegetation type on the “lighter” side of the image. Thus, from the satellite imagery available, it appears that either the amount of vegetation, or the type of vegetation, is markedly different between BLM lands and adjacent lands, and that this difference is due to ongoing grazing on the BLM lands versus a 15 to 22-year absence of grazing on Organ Pipe Cactus NM and Cabeza Prieta NWR.

Using the guidance from Holechek (1988) and Holechek *et al.* (1998), BLM’s estimated utilization rate “approaching 40 percent” at full preference (M. Taylor, BLM, *in litt.* 1997) does not appear appropriate to maintain areas of good and excellent range condition, or to restore, over time, degraded conditions elsewhere. Utilization has been monitored at several transects within the Ajo allotments and was summarized in the Environmental Baseline of this opinion. Table 6 provides a summary of the utilization estimates on the Sentinel, Coyote Flat, Why, and Cameron allotments from 1998 through 2000.

The Service believes that over the years, livestock grazing within the range of the Sonoran pronghorn has resulted in a significant level of habitat degradation that will require many years to fully recover. Furthermore, the Service believes that continued livestock grazing on the five allotments will continue to degrade habitat through changes in the composition, structure, and abundance of the vegetation community and soil erosion and compaction, reduced water infiltration rates, and increased runoff. Such degradation will reduce the amount of available vegetation cover needed by adults and fawns for protection from predators and relief from the desert heat, reduce the amount and/or quality of forage necessary for reproductive success and overall health of the pronghorn, and decrease the ability for the habitat to recover, resulting in injury or death to the pronghorn.

Trespass of livestock from the Ajo allotments has been reported on both Cabeza Prieta NWR and Organ Pipe Cactus NM, particularly after a precipitation event that may wash out areas adjacent to fences and allow cattle to pass underneath (S. Rutman, NPS, pers. comm. 2001; D. Segura, Service, pers. comm. 2001). Impacts to Sonoran pronghorn habitat from trespass cattle will continue to occur as a result of the proposed action. The presence of trespass cattle in these areas inhibit the on-going recovery of pronghorn habitat. In addition to the impacts from the cattle, returning cattle to the allotments causes an increase in vehicle and human disturbance in pronghorn habitat. The severity of impacts depends on the frequency, duration, distance from the allotments, time of year (i.e., during fawning season or not), and number of trespass cattle.

Burkhardt and Chamberlain (1982) found that, regardless of seasonal differences in species availability, grasses, forbs, and shrubs were consistent components of the diet of cattle in the Mojave Desert. They also found that in seasons or years when ephemeral vegetation was available, such plants "provided the bulk of the cattle food consumption" (Burkhardt and Chamberlain 1982). According to BLM's 1995 EA, cattle are physiologically driven to keep their rumens full even when available forage is of low quality. Furthermore, the EA states that "in areas where grass is not an abundant part of the vegetative composition, cattle are opportunistic foragers." BLM's preliminary analysis of the range conditions of the five allotments report that in several cases, the amount of perennial grass is less than BLM resources specialists would recommend for cattle grazing. Ephemeral livestock grazing increases the level of competition for ephemeral vegetation, decreasing the pronghorn's opportunity to take advantage of locally and temporally abundant forage. Sufficient forage, both pre- and post-natal, is necessary for reproductive success in pronghorn, as well as maintaining the health of adult pronghorn. The Service believes that the continued presence of livestock within the range of the Sonoran pronghorn may result in competition for forage that is already limited by local precipitation, contributing to low fawn recruitment and increased susceptibility to predation and/or disease.

Sonoran pronghorn currently occupy less than 10 percent of their historic range. They require vast areas of unencumbered open range to meet their annual survival and reproductive needs (Service 2001). Pronghorn travel long distances between localized, seasonally sporadic rainfall events in search of resources. The five allotments addressed in this opinion are within the historic range of this subspecies. Potential for expansion is limited, but is crucial for the continued survival and recovery of the pronghorn (Service 2001). BLM land west of SR 85 amounts to approximately 90,000 acres (Organ Pipe Cactus NM 2001) of sporadically occupied habitat. The potential for the pronghorn to use a greater extent of this habitat is apparently limited by the continued livestock grazing and human activities associated with grazing and recreation.

Childs Valley and Valley of the Ajo, which are within and immediately west and south, respectively, of the Ajo allotments, are important corridors for pronghorn seasonal movements. Yet telemetry data collected by AGFD from 1994 through 2001, show very few observations of radio-collared pronghorn within the Ajo allotments or the Sentinel Allotment. The lack of observations is very distinct at the fencelines between Cabeza Prieta NWR and Organ Pipe Cactus NM and the Ajo allotments (Figure 3). Pronghorn clearly use the habitat immediately west of the boundary of the Cameron and Childs allotments and the habitat immediately south of the Cameron and Coyote Flat allotments, but rarely cross the fenceline into BLM land. Both the Cabeza Prieta NWR and Organ Pipe Cactus NM fences are "pronghorn friendly" (bottom strand of the fence is of smooth wire, raised 16-18 inches from ground level) and have been so since 1980-1981 and the late 1980s-1999, respectively. It is possible that the fences are still perceived as a barrier by the pronghorn. However, pronghorn had been observed passing through the fence between Cabeza Prieta NWR and Organ Pipe Cactus NM, which was not pronghorn friendly, prior to its removal (S. Rutman, NPS, pers. comm. 2001). The reason for the pronghorn's

apparent reluctance to cross the fence into the Ajo allotments is not entirely clear, but is likely a combination of factors, and may include a lack of adequate resources (discussed above), the human disturbances associated with the grazing operations, and recreation within the Ajo allotments.

The Sonoran pronghorn's current range is boxed in by highways, railroads, fences, and canals. The fencing between adjacent Federal lands cannot be removed unless livestock grazing ceases west of SR 85. Although pronghorn friendly, these fences may still act as a barrier to movement. The Service believes the presence of the fencing restricts an important movement corridor for the pronghorn and, in conjunction with habitat degradation, is restricting the pronghorn's ability to expand its current range.

Disease Transmission

Blood samples collected from Sonoran pronghorn between 1994 and 2000 tested positive for antibodies for both BTV and EHD and samples from 1994 tested positive for leptospirosis, documenting exposure to these diseases. While the effect of the exposure is not known, some adult pronghorn mortality may, in whole or in part, be attributed to one or more of these diseases. Furthermore, exposure to these disease may be a factor in the low recruitment rate through decreased productivity and fawn mortality. The survival and recovery of the Sonoran pronghorn depends on an annual fawn crop of at least 30 percent, which has only occurred twice since 1992 (Defenders of Wildlife 1998). Given the extremely small population size of the Sonoran pronghorn, this species is at heightened risk to disease. Cattle, mule deer, white tailed deer, desert bighorn sheep, and the Sonoran pronghorn make up the common vector host pool of the hemorrhagic diseases within the range of the Sonoran pronghorn (T. Noon, Arizona Veterinary Diagnostic Lab, pers. comm. 2001). Artificial water sources, such as charcos (livestock watering ponds), likely provide wet sediment habitat for biting midge larvae. Therefore, the Service believes that presence of livestock within the action area will continue to potentially expose Sonoran pronghorn to leptospirosis, BTV, and EHD, which may result in low productivity and/or death of adults and fawns, decreasing the ability to reverse the current decline or potentially accelerating the decline.

Construction and Maintenance of Range Improvements

The permittee of the Cameron Allotment has proposed to redevelop an existing, non-functioning range improvement to replace or supplement the earthen reservoir referred to as Bob's Tank. The redeveloped water, referred to as New Well, is proposed to consist of a submersible pump, a 10,000-gallon storage tank, approximately three miles of plastic PVC pipe, and a water trough. The pipeline will be installed adjacent to an existing road in order to decrease surface disturbance.

Construction of New Well will cause temporary disturbance of the pronghorn from human activity, particularly if construction occurs during the critical fawning period (March 15 through

July 15). Studies by Workman *et al.* (1992) showed American pronghorn experienced changes in heart rate and body temperature when persons walked past the animal, drove past, or when a person entered the enclosure. Degradation of habitat around the new water is expected to occur from future concentrations of cattle in the area.

Conservation Measures

The modification of fencing between boundaries of the Cameron, Why, and Coyote Flat allotments was initially proposed (as described in the 1995 EA and the project description of the December 3, 1997, opinion) to be conducted as fencing needed to be repaired or replaced. However, BLM decided to replace the 18 miles of fencing all at once in 2000. Therefore, all of the fencing, except for some fencing around livestock water sources, within and adjacent to the Ajo allotments are pronghorn friendly, reducing the potential for pronghorn to become entangled and/or injured if they should attempt to pass through.

Strict enforcement of the 14-day camping limit may minimize direct and indirect impacts to pronghorn habitat by decreasing unauthorized long-term use. However, without rehabilitation of recreational areas, these areas will continue to degrade surrounding habitat through soil compaction and loss of vegetation, increasing the potential for significant erosion (Rutman 1996). Erosion results in a loss of vegetation used by pronghorn for thermal cover and protective cover from predators, particularly for fawns.

Continued and additional contribution by BLM to on-going monitoring, research, and implementation of recovery actions provides benefits to the survival and recovery of the pronghorn. The extent and immediacy of such benefits vary depending on the action. Monitoring and research are typically long-term efforts that indirectly benefit pronghorn by increasing our knowledge of the status, life history, and habitat requirements of this subspecies. Recovery actions may benefit the pronghorn immediately (i.e., installation of guzzlers) or later in time (i.e., habitat restoration).

Although the modification of fencing and enforcement of recreational activities minimize, to some extent, the impacts of activities occurring within the range of the pronghorn on BLM lands, and contributing to monitoring, research, and recovery actions provide benefits for pronghorn, these measures do not avoid the impacts associated with livestock grazing.

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Relatively small parcels of private and State lands occur within the currently-occupied range of the pronghorn near Ajo and Why, north of the BMGR from Dateland to Highway 85, and from the Mohawk Mountains to Tacna. State inholdings in the BMGR were recently acquired by the USAF. Continuing rural and agricultural development, recreation, vehicle use, grazing, and other activities on private and State lands adversely affect pronghorn and their habitat. MCAS-Yuma (2001) reports that 2,884 acres have been converted to agriculture near Sentinel and Tacna. These activities on State and private lands and along the Mexican border and the effects of these activities are expected to continue into the foreseeable future. Historic habitat and potential recovery areas currently outside of the current range are also expected to be affected by these same activities on lands in and near the action area in the vicinity of Ajo, Why, and Yuma.

Of particular concern are increasing illegal border crossings by undocumented migrants and smugglers. Deportable migrant apprehensions by Border Patrol agents in the Ajo Station increased steadily from 9,150 in 1996 to 20,340 in 2000. In 2001, estimates of undocumented migrants traffic reached 1,000 per night in Organ Pipe Cactus NM alone (Organ Pipe Cactus NM 2001). Increased presence of Border Patrol in the Douglas, Arizona area, and in San Diego (Operation Gatekeeper) and southeastern California, have pushed undocumented migrant traffic into remote desert areas, such as Cabeza Prieta NWR, Organ Pipe Cactus NM, and BMGR (Klein 2000). Illegal activities result in habitat damage in the form of new roads, discarded trash, cutting of firewood, illegal campfires and increased chance of wildfire (Organ Pipe Cactus NM 2001), and likely resulting in disturbance of pronghorn. These activities are likely to continue into the future and may continue to increase.

VI. CONCLUSION

After reviewing the current status of the Sonoran pronghorn, the environmental baseline for the action area, the effects of the proposed and ongoing BLM action, and the cumulative effects, it is the Service's biological opinion that continued grazing on the five allotments as described in the proposed action, is not likely to jeopardize the continued existence of the Sonoran pronghorn. No critical habitat has been designated for this species, thus, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount or Extent of Take Anticipated

The Service does not anticipate any incidental take of Sonoran pronghorn as a result of the proposed action.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends implementing the following actions:

1. Evaluate decreasing the numbers of livestock or permanent removal of livestock from the allotments west of SR 85 to eliminate negative effects on Sonoran pronghorn. If permanent removal occurs, fencing within the allotments should be removed. Additionally, BLM should coordinate with Cabeza Prieta NWR and Organ Pipe Cactus NM to ensure removal of the fencing between their respective boundaries and the Ajo allotments and assist with the removal effort.
2. Work with the Service to investigate the potential for disease transmission from livestock and other common vector host pool species, including any necessary modifications to artificial water sources to eliminate breeding habitat for biting midges and provide safe access for pronghorn.
3. Rehabilitate heavy-use recreation areas of Gunsite Wash and the base of the hills north of the Bates Well Road upon completion of the Land Use Plan amendment designating camping areas, roads, and trails. Rehabilitation should include, but not be limited to, removal of unauthorized structures or developments, decompaction of soils, and revegetation with native species.
4. Implement a seasonal (March 15 to July 15) emergency closure of roads, trails, and camping areas to the general public to be enacted and enforced annually prior to completion of the Land Use Plan amendment process.
5. Coordinate with Organ Pipe Cactus NM and Cabeza Prieta NWR to determine the extent of, and the appropriate measures to correct, the effects of erosion, impacting BLM land as

well as Organ Pipe Cactus NM and Cabeza Prieta NWR, resulting from historic and current land use practices on the Ajo allotments.

6. Prepare a pronghorn database from all historic sightings in the agency files and support an annual program of documenting wildlife sightings (including pronghorn) by employees that can be shared with other agencies and placed in the pronghorn database that is being managed by Luke AFB.
7. Permanently remove livestock grazing over all, or a significant portion of the Sentinel Allotment. If grazing is removed, the BLM should coordinate with appropriate military branch(es) regarding removal or modification of the fencing between the allotment and the BMGR. Additionally, BLM should, in coordination with the Service, ensure that appropriate fencing is located between the allotment and adjacent, non-Federal lands that would be unsafe for pronghorn to access (e.g., Interstate 8).
8. In coordination with the Sonoran Pronghorn Recovery Team, develop and implement a study to investigate and monitor the influences of disease (particularly those that may be transmitted by livestock) and other stressors to pronghorn.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on BLM livestock grazing on five allotments near Ajo. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation and assistance throughout this consultation process. Any questions or comments should be directed to David Harlow of the Arizona ESO at 602-242-0210.

Attachments



cc (w/attachments):

Manager, Cabeza Prieta National Wildlife Refuge, Ajo, AZ
State Director, Bureau of Land Management, Phoenix, AZ
Field Office Manager, Yuma Field Office, Bureau of Land Management, Yuma, AZ
Colonel James Uken, Barry M. Goldwater Executive Council, Luke Air Force Base, AZ
Park Superintendent, Organ Pipe Cactus NM, Ajo, AZ
First Lt. William Fay, Arizona Army National Guard, Phoenix, AZ
Ronald Pearce, Director of Range Management, Marine Corps Air Station, Yuma, AZ
Scott Bailey, Ecologist, Tohono O'odham Nation, Sells, AZ
Peter Ruiz, Director of Natural Resources, Tohono O'odham Nation, Sells, AZ
Mark Stermitz, Department of Justice, Washington, D.C.
Supervisor, Fish and Wildlife Service, Phoenix, AZ
Assistant Supervisor, Fish and Wildlife Service, Tucson, AZ
Regional Solicitor, Department of the Interior, Albuquerque, NM
Regional Section 7 Coordinator, Fish and Wildlife Service, Albuquerque, NM

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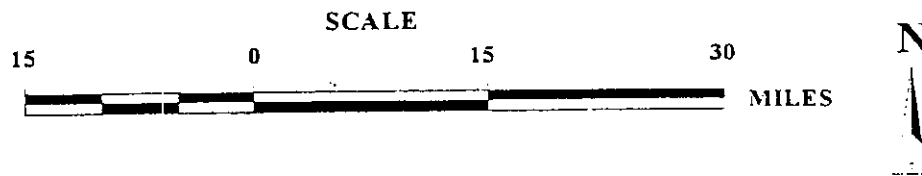
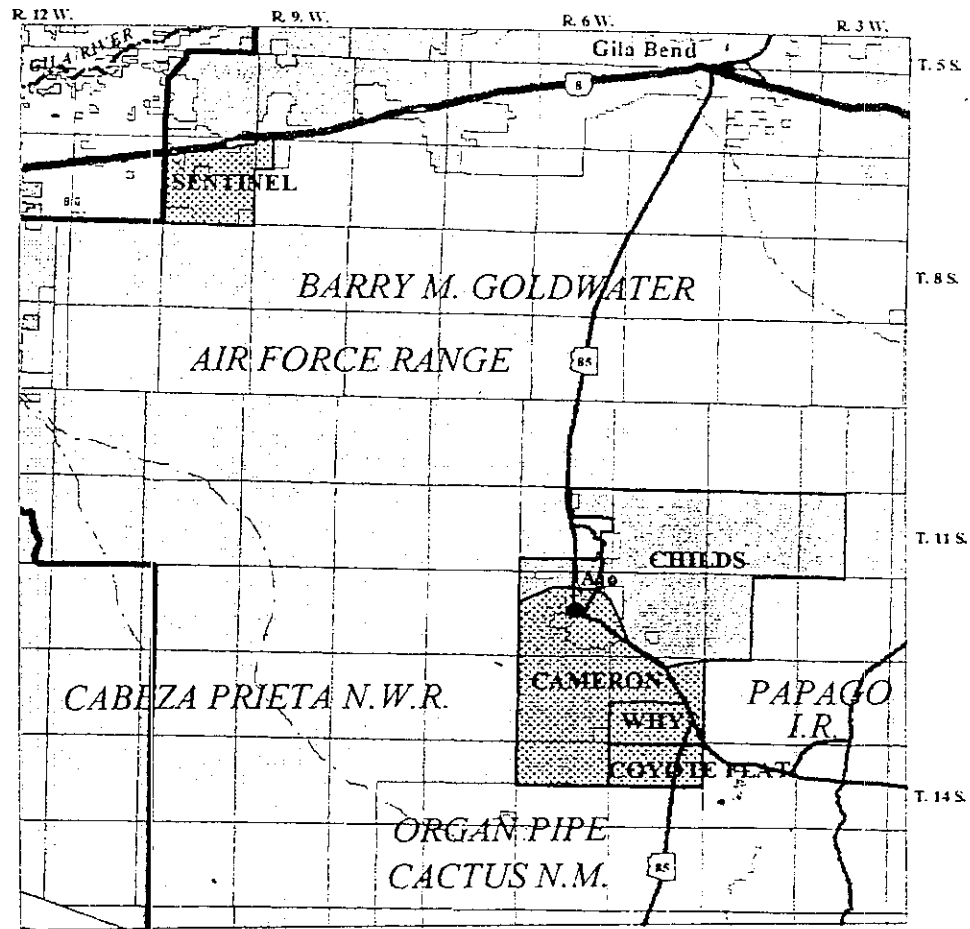
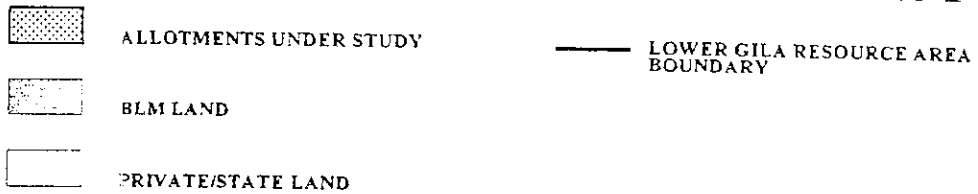
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LOCATION OF ALLOTMENTS UNDER STUDY



A-1-1

Figure 1. Location of the Coyote Flat, Why, Cameron, Childs, and Sentinel grazing allotments as designated in the Bureau of Land Management's September 1995, "Biological Evaluation on Grazing Activities Within Sonoran Pronghorn Habitat."

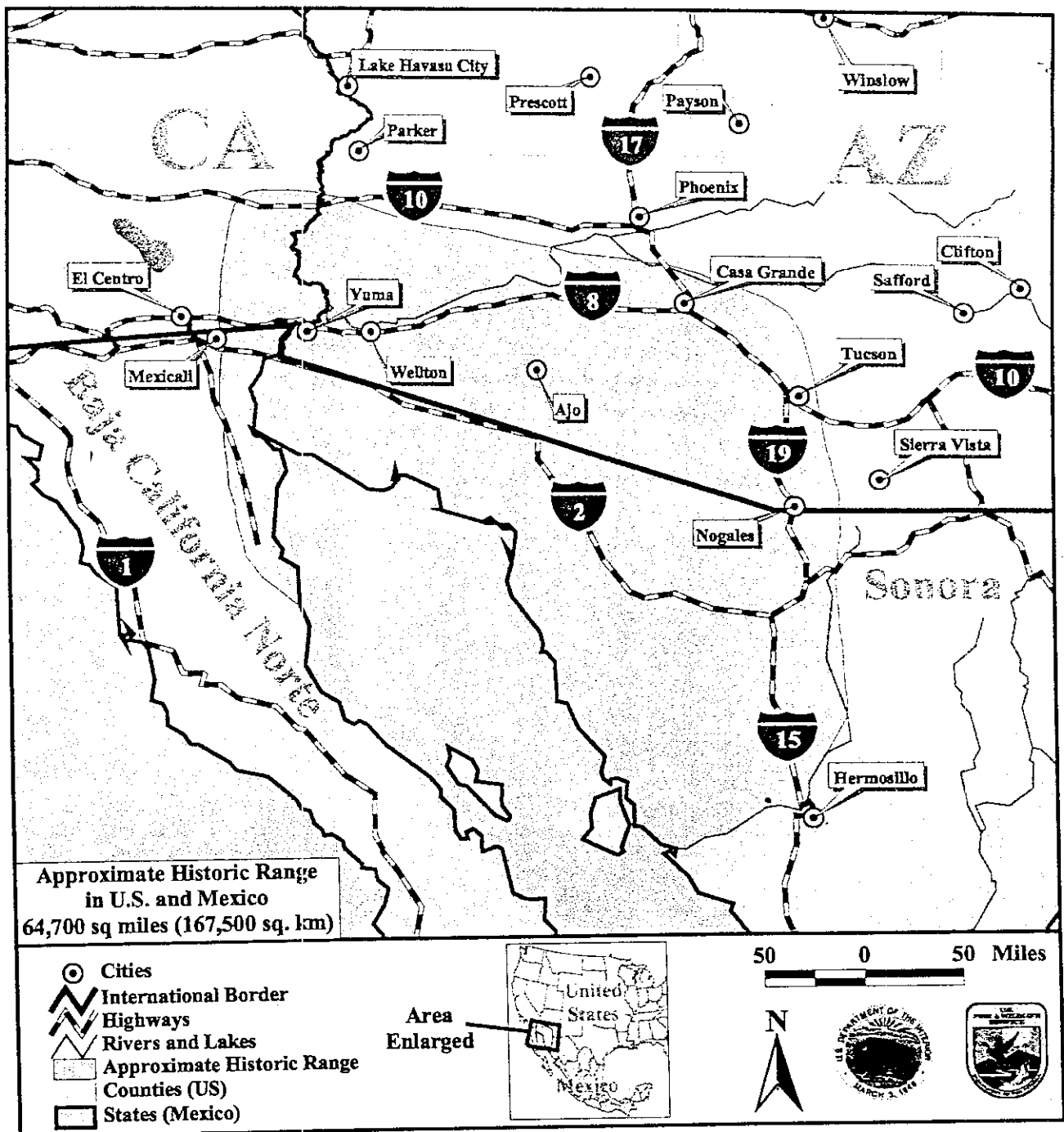


Figure 2. Historic range of Sonoran pronghorn in the United States and Mexico.

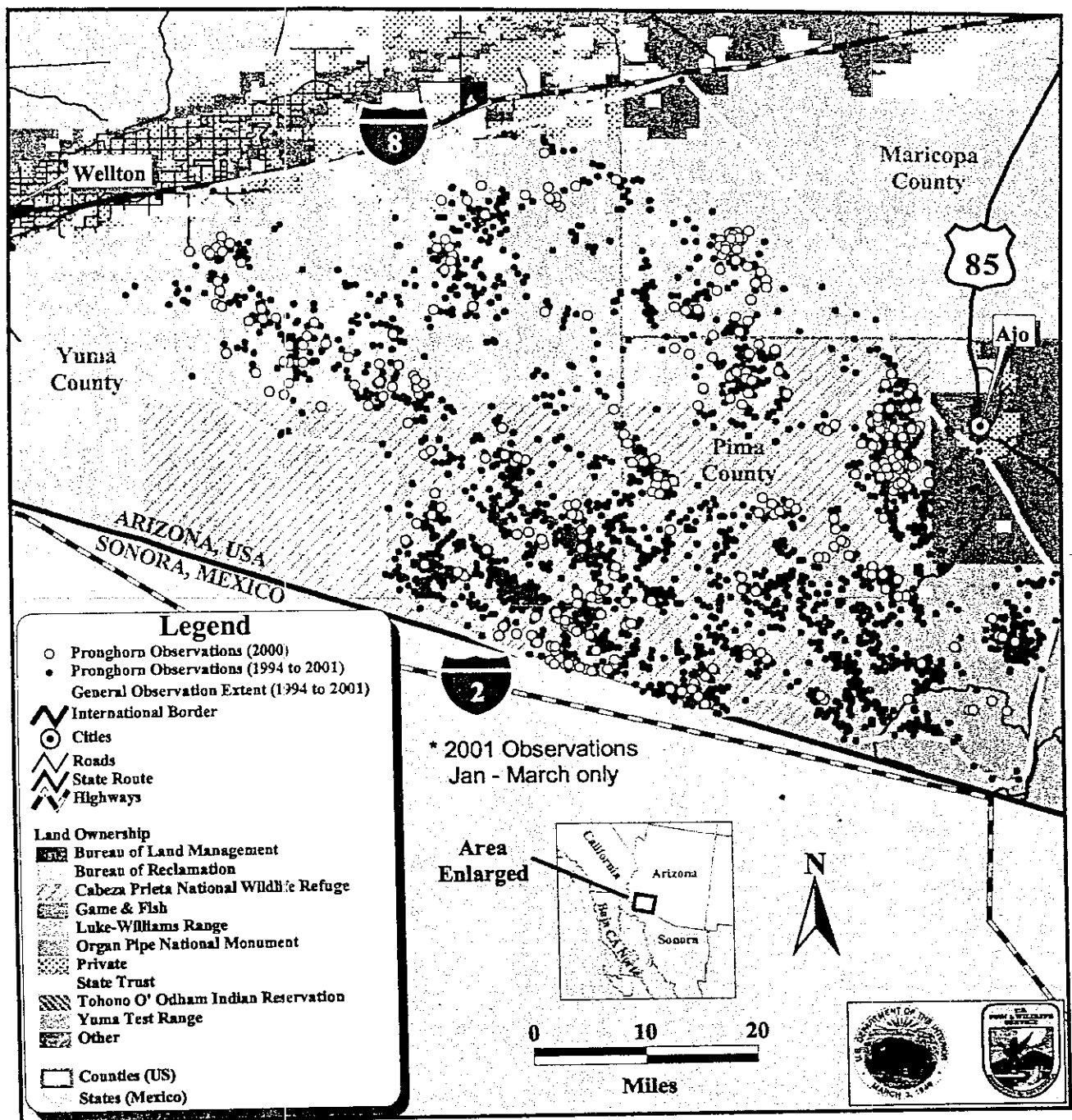


Figure 3. Current Sonoran pronghorn distribution in the United States: Records from 1994-2001.

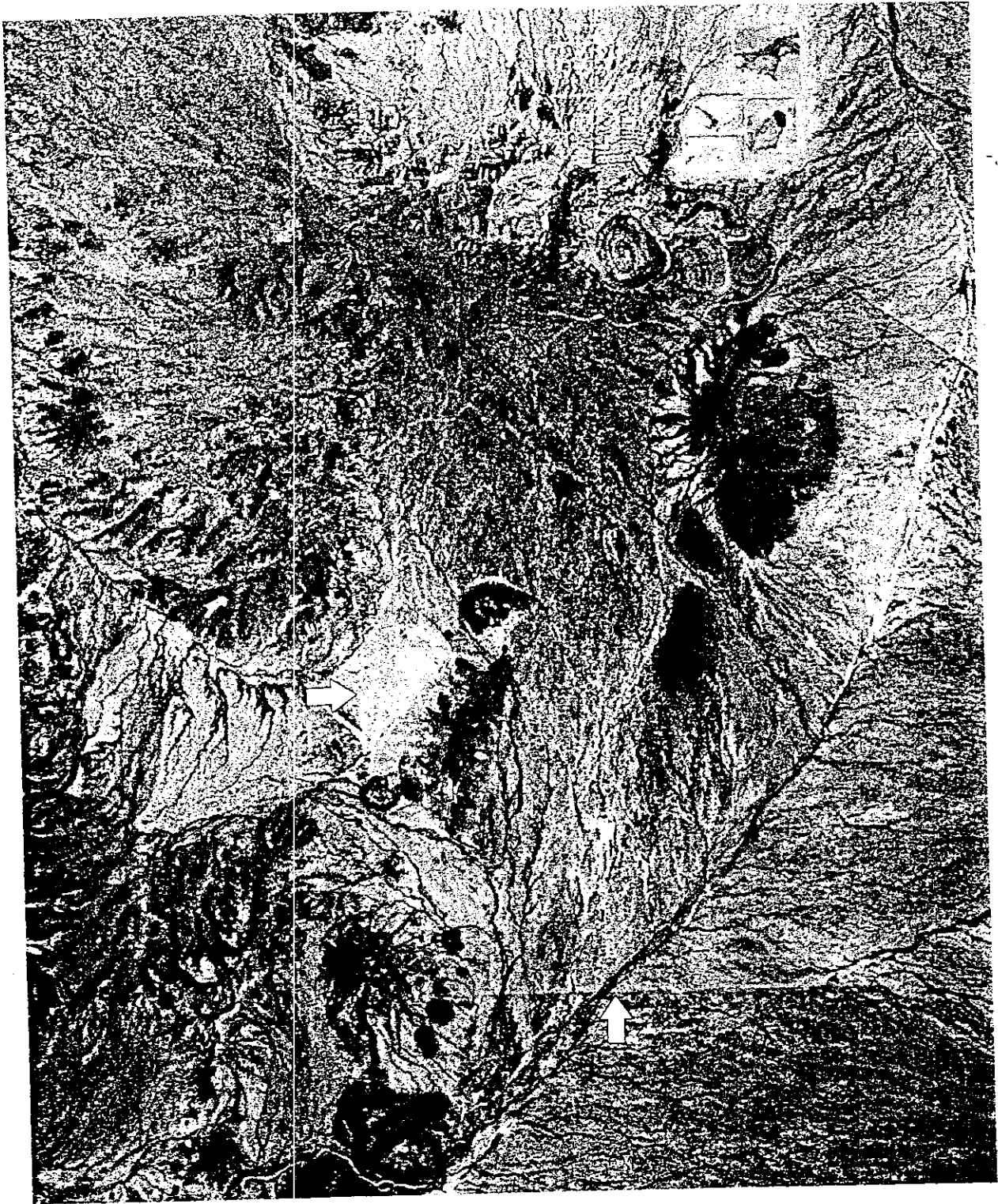


Figure 4. Satellite image of Ajo allotments. White arrows indicate boundary fence lines between the allotments and Cabeza Prieta National Wildlife Refuge and Organ Pipe Cactus National Monument. (Adapted from the poster, "Organ Pipe Cactus and Surrounding Areas: A Portrait from Above and Beyond," J.C. Dohrenwend, 2000)

Table 1. Authorized use of the Cameron, Coyote Flat, Why, Childs, and Sentinel allotments, 1970-2001. Parentheses indicate established preferences in Animal Unit Months (AUMs). Shaded cells indicate that data is unavailable. Adapted from the Bureau of Land Management's September 1995 "Biological Evaluation on Grazing Activities Within Sonoran Pronghorn Habitat" and additional information provided by the Bureau, 1992 - 2001 (Philip Cooley, BLM, pers. comm. 2001).

Year	Cameron (4076 through 1975; 2526 from 1976 ¹ -present)		Coyote Flat ² (456)	Why ² (452)	Childs (3802)		Sentinel (360)	
	Permitted Use	Ephemeral Use	Permitted Use	Permitted Use	Permitted Use	Ephemeral Use	Permitted Use	Ephemeral Use
1970	1896							
1971	2064		456	21				
1972	3096		456	238				
1973	2376	212	456	0				
1974	2172	900	456	456				
1975	1548	1548	456	456	2528			
1976	1548	1548	456	120	2376			
1977	2148	820	456	216	2376			
1978	2472	3640	0	216	2871			
1979	1452	8250	456	456	3802			
1980	1452		456	456	1664		0	0
1981	360		456	456	1103		11	0
1982	996		456	0	1685		255	0
1983	2524	130	456	180	2464	990	268	1437
1984	1236	5561	456	180	3802	11627	360	1472
1985	1200	4605	456	240	0		24	1268
1986	672	4000	456	360	0		308	1493
1987	672		456	360	0		96	0
1988	636		456	144	0		0	0
1989	180		456	144	0		360	781
1990	164	16	456	0	546		360	413
1991	241		456	0	679		0	0

Year	Cameron (4076 through 1975; 2526 from 1976 ¹ -present)		Coyote Flat ² (456)	Why ² (452)	Childs (3802)		Sentinel (360)	
	Permitted Use	Ephemeral Use	Permitted Use	Permitted Use	Permitted Use	Ephemeral Use	Permitted Use	Ephemeral Use
1992	120	0	456	0	784	0	0	0
1993	539	0	456		862	0	360	0
1994	108	1149	456	100	1034	0	0	406
1995	175	3305	456	132	1037	0	0	0
1996	1281	0	456	83	1651	0	0	0
1997	814	0	0	120	832	0	0	0
1998	1472	0	228	108	832	0	0	0
1999	696	0	228	108	748	0	0	0
2000	700	0	228	168		0	0	0
2001	469	0	228	282 ³	380	0	0	0

¹A portion of the Cameron Allotment was relinquished for establishment of the Cabeza Prieta National Wildlife Refuge in 1976, reducing the preference by 1550 (i.e., 4076 - 1550 = 2526).

²There has been no ephemeral use requested on this allotment.

³Permit transfer completed 05/01; 26 AUMs used by previous permittee.

Table 2. A summary of population estimates from literature and field surveys for Sonoran pronghorn in the U.S.

Date	Population estimate (95 percent CI ^a)	Source
1925	105	Nelson 1925
1941 ^b	60	Nicol 1941
1957	<1,000	Halloran 1957
1968	50	Monson 1968
1968-1974	50 - 150	Carr 1974
1981	100 - 150	Arizona Game and Fish Department 1981
1984	85 - 100	Arizona Game and Fish Department 1986
1992	179 (145-234)	Bright <i>et al.</i> 1999
1994	282 (205-489)	Bright <i>et al.</i> 1999
1996	130 (114-154)	Bright <i>et al.</i> 1999
1998	142 (125-167)	Bright <i>et al.</i> 1999
2000	99 (69-392)	Bright <i>et al.</i> 2001

^a Confidence interval; there is only a 5 percent chance that the population total falls outside of this range.

^b Population estimate for southwestern Arizona, excluding Organ Pipe Cactus National Monument.

Table 3. Comparison of U.S. Sonoran pronghorn population surveys, 1992-2000.

Date	Pronghorn observed		Population estimates		
	On transect	Total observed	Density estimate using DISTANCE (95 percent CI) ^a	Lincoln-Peterson (95 percent CI)	Sightability model (95 percent CI) ^a
Dec 92	99	121	246 (103-584)	---	179 (145-234)
Mar 94	100	109	184 (100-334)	---	282 (205-489)
Dec 96	71	82 (95 ^b)	216 (82-579)	162 (4-324)	130 (114-154)
Dec 98	74	86 (98 ^b)	---	172 (23-321)	142 (125-167)
Dec 00	67	69 ^b	---	---	99 (69-392)

^a Confidence interval; there is only a 5 percent chance that the population total falls outside of this range.

^b Includes animals missed on survey, but located using radio telemetry.

Table 4. Population estimates from literature and field surveys for Sonoran pronghorn in Mexico.

Date	Population estimate (95 percent CI) ^a	Source
1925	595	Nelson 1925
1957	>1,000	Villa 1958
1981	200-350	Arizona Game and Fish Department 1981
1993	414 (317-644)	Bright <i>et al.</i> 1999
2000	346 (288-445)	Bright <i>et al.</i> 2001

^a Confidence interval; there is only a 5 percent chance that the population total falls outside of this range.

Table 5. Comparison of Sonoran pronghorn surveys in Mexico, 1993 and 2000.

	Total number of pronghorn seen	Sightability model (95 percent CI ^a)
<i>March 1993</i>		
Southeast of Highway 8	163	289 (226-432)
West of Highway 8	51	124 (91-211)
Total	214	414 (317-644)
<i>December 2000</i>		
Southeast of Highway 8	249	311 (261-397)
West of Highway 8	17	34 (27-48)
Total	266	346 (288-445)

^a Confidence interval; there is only a 5 percent chance that the population total falls outside of this range.

Table 6. Utilization studies within Sentinel, Coyote Flat, Why, and Cameron allotments as reported in the 1998-1999 and 2000 reports from the Bureau of Land Management to the Service per the terms and conditions of the December 3, 1997, biological opinion (consultation number 2-21-94-F-192).

Allotment	Year	Date Read	Species		Estimated Utilization (%)
Sentinel	1998 ¹	11/09/98	mesquite (<i>Prosopis velutina</i>)		0.0
			big galleta (<i>Hilaria rigida</i>)		0.0
	1999 ¹	11/04/99	mesquite		0.0
			big galleta		0.0
	2000 ¹	10/24/00	mesquite		3.0
			big galleta		3.0
Coyote Flat	1998	11/22/98	<i>Lycium</i> spp.		0.0
			mesquite		0.0
	1999	10/05/99	<i>Lycium</i> spp.		0.0
			mesquite		0.0
	2000 ²	10/25/00	<i>Lycium</i> spp.		3.0
			mesquite		3.0
	2001	?	R-KP-1	mesquite	2.5
				wolfberry	2.5
				bush muhly	16.0
			R-DW-1	big galleta	43.1
			R-DW-2	palo verde	3.6
Why	1998	11/23/98	<i>Lycium</i> spp.		2.5
			mesquite		2.5
	1999	10/13/99	<i>Lycium</i> spp.		0.0
			mesquite		0.0
	2000 ³	10/25/00	<i>Lycium</i> spp.		3.0
			mesquite		3.0
	2001		R-KP-1	mesquite	2.5
				wolfberry	2.5
			R-DW-2	mesquite	2.5

Allotment	Year	Date Read	Species		Estimated Utilization (%)
Cameron	1998	04/29/98	R-KP-1	fairy duster (<i>Calliandra eriophylla</i>)	2.5
			R-KP-2	big galleta	0.0
				bush muhly (<i>Muhlenbergia porteri</i>)	0.0
			R-KP-3	mesquite	0.0
				blue palo verde (<i>Parkinsonia floridum</i>)	0.0
	1999	11/03/99	R-KP-1	fairy duster	2.5
			R-KP-2	big galleta	3.6
				bush muhly	2.5
			R-KP-3	mesquite	2.5
				blue palo verde	2.5
	2000 ⁴	10/25/00	R-KP-1	fairy duster	2.5
			R-KP-2	big galleta	9.0
				bush muhly	10.0
			R-KP-3	mesquite	3.0
				blue palo verde	3.0
	2001	?	R-KP-1	false mesquite	2.5
			R-KP-2	big galleta	13.1
				bush muhly	41.7
			R-KP-3	mesquite	2.5
				blue palo verde	3.6
			R-KP-3a	big galleta	48.1
			R-DW-2	mesquite	2.5
			R-DW-3	mesquite	3.6
				white bursage	5.3
			R-DW-4	chuparosa	76.8
				mesquite	5.7

¹Allotment was in non-use.

²Permittee was licensed for 20 cows (228 AUMs) and took non-use on 20 cows (228 AUMs).

³Permittee was licensed for 14 cows (168 AUMs) and took non-use on 24 cows (288 AUMs).

⁴Permittee was licensed for 50 cows (600 AUMs) and 8 horses (96 AUMs) and took non-use on 153 cows (1836 AUMs).

Appendix 1. Sonoran pronghorn 51 recovery actions as presented to the Service's Region 2 Regional Director by the Sonoran Pronghorn Recovery Team.

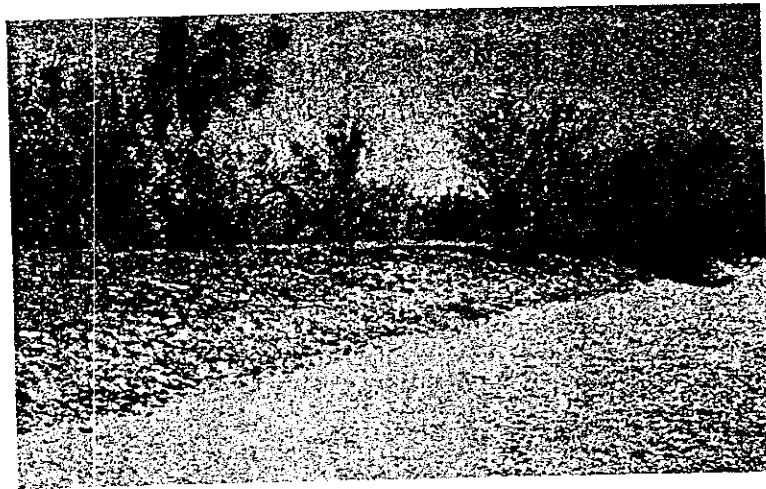
Ranking		Sonoran Pronghorn Recovery Actions
Priority	Average	
1	1.00	Maintain active radiocollars on ~10% of the Sonoran pronghorn population for population monitoring and other study purposes
2	1.18	Experimentally place small, portable, temporary waters in occupied habitat during the summer months, and evaluate their use and efficacy
3	1.18	Develop a white paper that addresses the full range of captive breeding alternatives (e.g., capture alternatives; age and sex of wild caught animals; husbandry requirements, herd monitoring, holding facilities, transportation, release criteria, need for predator control, post-release monitoring, and etc.)
4	1.18	Continue biennial, or possibly annual, population survey of the U.S. subpopulation
5	1.18	Continue weekly aerial monitoring of radiocollared pronghorn (i.e., distribution, movements, mortality signals, fawn status, predator presence)
6	1.27	Develop an intensive monitoring program to quantitatively investigate pronghorn use of water tanks (i.e., permanent, semi-permanent, temporary, emergency)
7	1.27	Continue monitoring fawn recruitment while conducting weekly telemetry flights
8	1.27	Implement and monitor experimental forage enhancement project on BMGR
9	1.36	Identify, evaluate, and prioritize potential reintroduction sites in the U.S. and Mexico
10	1.36	Initiate biennial population surveys for the 2 Mexico subpopulations to be timed in conjunction with the U.S. survey
11	1.45	Continue monitoring (and closing as needed) of military targets, relative to pronghorn locations, by contract biologists on NTAC and STAC on BMGR on live fire days
12	1.45	Continue ongoing program of hauling water as needed to permanent tanks in currently occupied pronghorn habitat (e.g., Jose Juan Charco, Halliwill Catchment, etc.) until proposed pronghorn/water investigations are conducted and program can be quantitatively reevaluated
13	1.73	Develop a study looking at seasonal diets (e.g., fecal analysis)
14	1.73	Continue restrictions on types of use in important pronghorn habitat during critical periods of the year (e.g., OPCNM periodic seasonal closure of Pozo Nuevo Road; CPNWR closure to public use of Chico Shunie Loop Road, Marine use of certain ground sites on BMGR)
15	1.73	Contract with a population geneticist or American Zoological Association to conduct an analysis of what comprises a minimum population in order to maintain the gene pool and to assess at what point if the U.S. subpopulation continues to decline, all remaining pronghorn should be taken into captivity

16	1.82	Initiate study by AGFD to evaluate effects of Border Patrol helicopter flights on pronghorn
17	1.91	Develop study to investigate potential contaminant concerns from military activities on BMGR (e.g., soil/vegetation sampling; blood and tissue samples from captured pronghorn; sampling of other resident wildlife) for baseline data
18	1.91	Continue aggressively investigating and documenting all incidences of mortality (collared and uncollared) and likely causes
19	1.91	Deploy remote data loggers as needed to document use of water sources, travel corridors, and/or foraging areas by radiocollared pronghorn
20	1.91	Initiate AGFD/USAF study to evaluate effects of night missions on pronghorn behavior/activity
21	1.91	Experimentally mark a sample of coyotes with GPS collars to determine behavior and seasonal movements relative to pronghorn locations, free water, rainfall events
22	2.00	Develop a study to monitor/investigate influences of disease and other stressors on pronghorn
23	2.00	Assess effectiveness of current aerial population survey methodology and compare with current literature
24	2.00	Continue law enforcement activities designed to reduce illegal border traffic (e.g., foot and vehicle UDA's, drug smuggling) and as a consequence movement through pronghorn habitat
25	2.09	Investigate Culicoides sp. as a vector source in the transmission of bluetongue and EHD to pronghorn from cattle and other native ungulates
26	2.09	Continue field work by U of A and preparation of vegetation association map for OPCNM, BLM, CPNWR, BMGR
27	2.09	Develop a water balance study (e.g., double-labeling, water deprivation, use of pre-formed/metabolic water in diet) using a surrogate race of captive pronghorn
28	2.09	Expand genetic determinations to include Mexico as opportunity allows (e.g., Peninsular pronghorn and Sonoran subpopulations)
29	2.18	Investigate impacts of helicopters from other program activities (e.g., Marine Corps WTI, other military activities, U.S. Customs Service, other State and Federal management agencies) on pronghorn
30	2.18	Initiate periodic aerial surveys in Mexico at other times of the year than the population census to monitor herd size, composition, distribution, natality, etc.
31	2.18	Investigate effects of public use and other ground-based activity (e.g., military training, ordnance clean-up, law enforcement, land management agency activities such as grazing, firewood cutting, and mining) on pronghorn
32	2.18	Complete AGFD contract with Purdue University to look at taxonomic status using established genetic markers of Sonoran pronghorn relative to other races of pronghorn

33	2.27	Continue to promptly notify CPNWR of all pronghorn mortalities; recovery team leader keeps a file on all reports and maintains a summary table of all mortalities and known facts
34	2.27	Incorporate a habitat assessment component in currently used population survey technique to monitor annual change/variation in range condition
35	2.27	Complete range assessment of 4 allotments by the BLM and application of Standards and Guidelines to ensure adequate forage for pronghorn and habitat improvement
36	2.27	Evaluate pronghorn location data relative to available habitat using normalized digital vegetation index and/or other forms of satellite data
37	2.36	Develop a narrowly-defined and rigidly controlled coyote removal plan
38	2.36	Develop study to continue to evaluate water quality at bomb craters that fill with water and are frequented, at least seasonally, by pronghorn
39	2.36	Update the PVA in light of new, more quantified data on various aspects of pronghorn biology and PVA techniques
40	2.36	Evaluate occurrence of bluetongue and EHD in cattle and native ungulate species and their potential to serve as a reservoir for these diseases
41	2.45	Fix highway (e.g., Highway 85, Interstate 8), International Boundary, and other fences to make them pronghorn accessible or pronghorn barriers as determined necessary
42	2.45	Prepare a written protocol for dealing with injured or dead pronghorn including permit authority, agency and veterinarian contact numbers, notification protocol, transportation, housing and/or disposal procedures
43	2.55	Compile extant reports of pronghorn watering (documented and anecdotal), review of literature, and prepare a technical reviewed article
44	2.55	Continue timely coordination with Recovery Team and Phoenix Ecological Services Office on all proposed use changes on Tactical Ranges
45	2.55	Investigate blank spots in current pronghorn range distribution maps (e.g., targeted aerial surveys, remote sensing)
46	2.55	Experimentally provide mineral supplement blocks
47	2.55	Conduct a comprehensive literature review of pronghorn/barrier interactions and wildlife passage devices and designs (to include literature for other ungulate species when appropriate)
48	2.63	Develop a back-up plan in the event of a hoof and mouth outbreak
49	2.7	Construct and staff a Sonoran Desert greenhouse for producing key forage plants for transplanting
50	2.7	Assess all wildlife and livestock waters on 4 BLM allotments as to pronghorn accessibility and/or potential traps
51	2.9	Develop a medical kit with all necessary materials for treatment, salvage, and/or necropsy with description of procedures and handling of biological samples

Each recovery team member assigned a rank of high = 1, medium = 2, or low = 3 to each project. Since there are 51 projects and 3 rankings, exactly $1/3$ of the projects were ranked high, medium, or low by individual team members. The assigned rankings were averaged and the lower the score, the higher the priority. In the event of a tie between 2 or more projects, the project with the lowest variance was ranked higher. The theoretical highest and lowest possible rank that can be achieved by a given recovery action is 1.0 and 3.0, respectively.

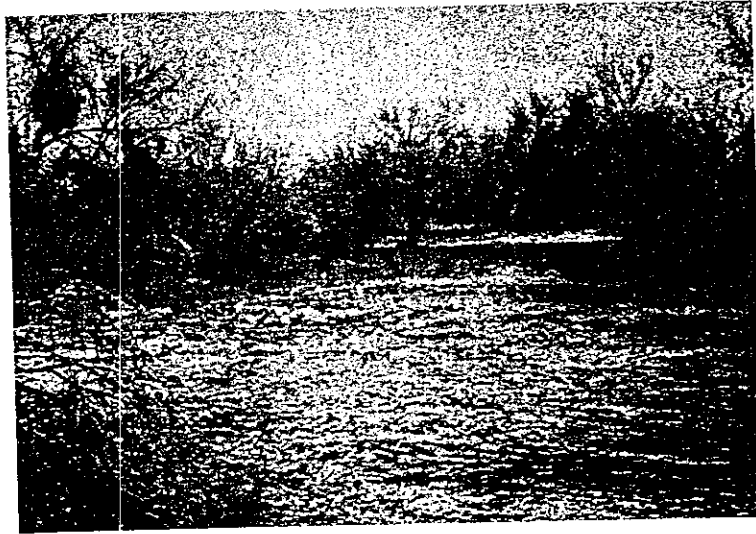
Appendix 2: 1995 photographs of Cuerda de Lena. All photographs by S. Rutman, Organ Pipe Cactus National Monument, March, 1995.



Photograph 1a. West bank of the western branch of Cuerda de Lena at the north boundary of the Monument, looking north onto public lands managed by the Bureau of Land Management. The riparian zone has patches that are devoid of woody perennials; remaining trees are hedged. The wash bank is chiseled by livestock. Vines are scarce or absent.



Photograph 1b. East bank of the west branch of Cuerda de Lena at the north boundary of the Monument, looking south onto public lands managed by the NPS (wash bed in foreground). Trees line the riparian zone, and understory growth is abundant. Note the vine *Clematis drummondii* (Virgin's bower) in the tree in the left foreground; this species is abundant along Cuerda de Lena within the Monument.



Photograph 2a. West of the western branch of Cuerda de Lena, looking north of the northern boundary of the Monument on lands managed by the Bureau of Land Management. Note the general lack of understory perennials, especially vines, and the hedged appearance of the trees.



Photograph 2b. West bank of the western branch of the Cuerda de Lena, looking south onto public lands managed by the National Park Service. Trees have begun to regain natural form and understory perennials were common. Open spaces have yet to recover, although one young creosote bush had colonized the open area (near center).



Photograph 3. West side of Cuerda de Lena, about 1/4 mile north of the Monument's north boundary. Large barren areas have developed where there are no mature or young perennial plants. Note the young tree rooted in the eroding and chiseled wash bank.



Photograph 4. West side of the degraded Cuerda de Lena riparian area, on Bureau of Land Management land near the north boundary of the Monument. A view of the large open areas lacking woody perennials. The mesquite trees (left center and background right) are hedged, as is the large creosote bush (right center).



Photographs 5 (left) and 6 (right). Photograph on the left was taken on the west side of Cuerda de Lena, on Bureau of Land Management land about 1/4 mile north of the north boundary of the Monument. The riparian zone was open, trees were hedged, understory woody perennial cover and density was low, and a lot of sunlight reached the soil surface. Photograph on the right was taken on the west side of Cuerda de Lena, on the Monument just south of the north boundary. Photographs of the riparian forest here were difficult to take because light was low and general tangle of vines and other understory shrubs prevented a view.



Photograph 7. The bank of Cuerda de Lena, on the Monument near the north boundary. Note the discrete interface between the active stream bed (white sand/gravel) and the wash bank. A cryptobiotic soil crust stabilized this interface, even in the flood-scour zone. Mosses were an important component of the soil crust. The discrete interface and presence of cryptobiotic soil crust along the wash banks was typical of most but not all of the Cuerda de Lena on the Monument.



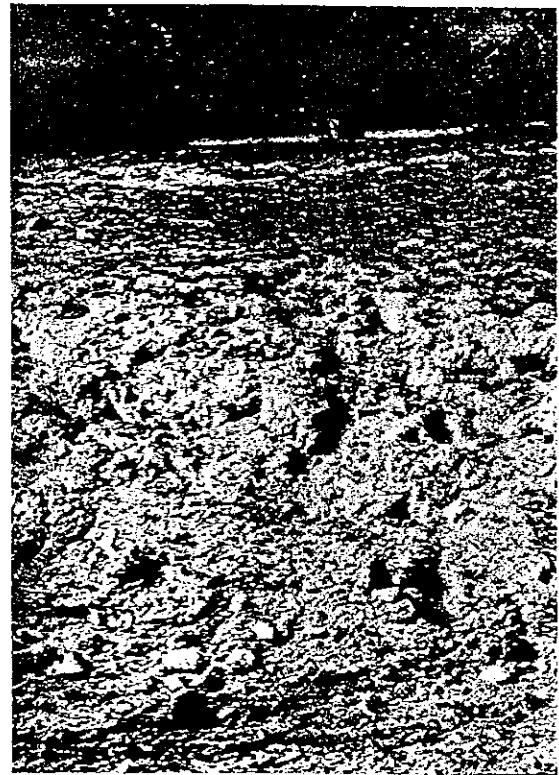
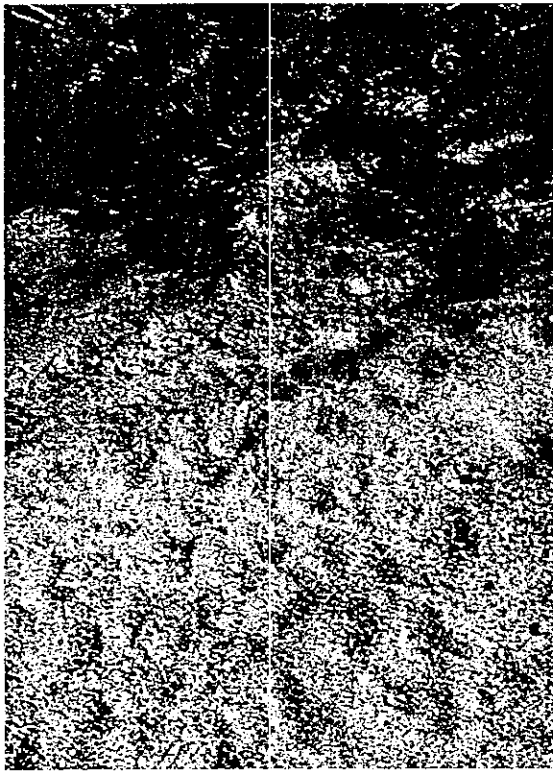
Photograph 8. The bank of Cuerda de Lena, on the Monument near the north boundary, showing another view of the discrete interface between the active stream bed (white sand/gravel) and the wash bank.



Photograph 9. The bank of Cuerda de Lena, on Bureau of Land Management land north of the Monument's north boundary. The banks of the wash were destabilized and devoid of cryptobiotic soil crust. The canyon ragweed (*Ambrosia ambrosioides*) on the left side of the photograph was being undercut by bank erosion.



Photograph 10. The bank of Cuerda de Lena, on Bureau of Land Management land north of the Monument's north boundary. Close-up of the area in Photograph 9. Cattle were chiseling the wash bank. Establishment of woody perennials would be difficult if not impossible under these conditions.



Photograph 11 (left) and 12 (right). Comparison of deer crossing versus livestock crossing of Cuerda de Lena. A deer trail (left) across a bank of Cuerda de Lena was narrow. Livestock crossed where convenient and caused widely dispersed impacts.